



Tropenzentrum
*Centre for Agriculture in the Tropics
and Subtropics*

- Report 2004 / 2005 -

approved by the board of the Tropenzentrum
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Preface



The University of Hohenheim is well known in Germany for its development-oriented research in numerous disciplines, involving various large inter-disciplinary

research projects. The Centre for Agriculture in the Tropics and Subtropics ("Tropenzentrum") at Hohenheim is the representative and consolidating body for these activities and is responsible for the packaging and coordination of development oriented activities in research and academic teaching. The backbone of the Tropenzentrum, established in 1982, comprises ten so-called "tropical chairs" in the fields of plant and animal production, agricultural economics, social sciences, and agricultural engineering.

The Tropenzentrum's interdisciplinary approach in research and teaching makes this centre highly competitive compared with other similar centres worldwide. This certainly does not mean that we can rest on our laurels. With the help of its members the management unit of the Tropenzentrum is making a continuous effort to take on prestigious research projects that will provide scientific expertise for a successful and sustainable development of the agricultural and food sectors in many countries.

With this 2004/2005 report, the Tropenzentrum presents its activities and those of its members from the past two years. It shows that Hohenheim scientists are active in over 47 countries from the tropical hemispheres. The research projects range from a single PhD research in the hillsides of Honduras to the full-scale interdisciplinary special research project "The Upland Program" SFB564 in Thailand and Viet Nam.

The most prominent events of the Tropenzentrum, which took place in the last two years were without doubt the excursion to Costa Rica in 2004 and the organisation of the Tropentag 2005 conference in Hohenheim.

The excursion to Costa Rica has revived the tradition of the Tropenzentrum to organise regularly, together with a partner university from a tropical country, a so-called "joint excursion" (große Tropenexkursion). Twenty students accompanied by five scientists from Hohenheim took part in a three weeks tour to Costa Rica to cover issues related to tropical agriculture, rural development, the role of research and teaching, industrial development as well as implementing development projects in tropical countries. The main purpose of these excursions is to apply the theoretical knowledge, which was acquired during studies in Hohenheim and to gain direct practical experience on agricultural production systems, as well as agricultural structures and sectors.

In October 2005 it was the turn of Hohenheim to organise the annual Tropentag, which encompasses the International Conference for Research and Development in Agriculture and Forestry, Food and Natural Resource Management, which is an event shared by the Universities of Berlin (Humboldt), Bonn, Göttingen, and Kassel (Witzenhausen). Altogether we were able to welcome 520 visitors from 47 countries, who attended 110 oral presentations that took place concurrently. More than 300 posters classified into 21 groups were put forward and discussed in various guided poster sessions.

As a central unit of the University of Hohenheim, the Tropenzentrum survives from the engagement of its members. Due to the activities from the members documented in this report, the way for the Tropenzentrum will be paved ahead for an inspiring future.

Hohenheim, June 2006

Prof. Dr. Klaus Becker
Chair of the board of the Tropenzentrum

1 Organisation, structure and finances

Structure of the Tropenzentrum

Member assembly			
98 members from 10 tropical oriented chairs and 45 further specialisms of the University of Hohenheim, organised in 4 thematic groups:			
Plant production and landscape ecology	Animal production	Agricultural economics and social sciences	Agricultural engineering and food technology

Advisory board:

(as of December 2005)

Dr. Andrea Fadani
- Eiselen-Stiftung Ulm -
Ulrich Heinrich, MdB a.d.
- Deutscher Bundestag -
Dr. h.c. Claus-Peter Hutter (LSU Philippines) (chair)
- Umweltakademie Ba-Wü -
Ingrid Walz
- Deutsche Stiftung Weltbevölkerung -
Dr. Ingrid Wüning
- Robert-Bosch-Stiftung -
Günter Dresrüsse
- GTZ -

Board:

(term 01.01.2004 – 31.12.2005)

Prof. Michael Ahlheim
Prof. Klaus Becker (chair since 11.2004)
Prof. Werner Bessei
PD Dr. Gertrud Buchenrieder
Prof. Reinhold Carle
Prof. Hartwig H. Geiger
Dr. Ludger Herrmann (resigned 12.2004)
Dr. Sabine Fiedler (since 01.2005)
Prof. Karlheinz Köller (vice chair -resigned 11.2004)
Prof. H. Rüdiger Korff (chair - resigned 09.2004)
Prof. Joachim Müller (vice chair - since 11.2004)
Prof. Matin Qaim (since 11.2004)
Prof. Rainer Schultze-Kraft
Tatjana Schulz (01.2004-12.2004)
Oliver Kneer (01.2005-12.2005)

Management unit:

Dr. Christian Hülsebusch (executive manager – resigned 31.10.2005)
Dr. Eric Tielkes (scientific assistant; executive manager since 01.11.2005)
Heidi Beinert (secretary, retired 31.07.2005)
Margit Völmle (secretary)
Andrea Tchitchi, geb. Schäwel, (delegated from MWK, 03.2004 –09.2004)

Director:

Prof. Klaus Becker

Vice-director:

Prof. Joachim Müller

Coordination M.Sc. courses :

Sabine Burkhardt (coordinator Tropen-Master – maternity leave since 31.07.2005)
Kerstin Hoffbauer (coordinator Tropen-Master and OrganicFood since 01.07.2005)
Alexander Schenk (coordinator Enviro-Food and AgEcon)

Membership

Participation of scientists in the centre's activities is by membership. The ten professors heading the tropical oriented chairs are "born members" of the centre. Besides these, all scientists of the university can become associate members upon application to the centre's board, if they are engaged in research or teaching in the fields of agricultural-, food- or environmental-sciences in (sub)tropical countries.

The current list of members and their affiliation is presented in annex 1 and 2. We would like to welcome several new members: Dr. Thomas Berger (490), Prof. Georg Cadisch (380), Michael Frei (480), Prof. Joachim Müller (495), Dr. Sybille Neidhart (150), Dr. Heiko Parzies (359), Dr. Florian C. Stintzing (150) and Prof. Manfred Zeller (490).

PD Dr. Buchenrieder (490), Claudia Garrido (730), Dr. Jürgen Erhardt (140), Dr. Christian Hülsebusch (790), Prof. Jürgen Kroschel (380) and Dr. Gerhard Lung (360) have left the service of the University of Hohenheim, and therewith their membership at the Tropenzentrum ended.

During the past two years, four out of ten chair holders dedicated to different aspects of agriculture in the (sub)tropics have left our university. Prof. Matthias von Oppen (Agricultural Marketing) retired in March 2004; Prof. Werner Mühlbauer (Postharvest and Energy Technology) retired in Sept. 2004, and Prof. Franz Heidhues (Agricultural Development Theory and Development Policy) retired in Nov. 2005. Finally, Prof. Heinz-Rüdiger Korff (who held the position of Visiting Professorship for Development Research) was appointed at the University of Passau in Sept. 2004.

The Tropenzentrum would like to thank all these members for their engagement at the university.

Prof. Dr. Dres. h.c. Dietrich Fewson (Animal Husbandry and Animal Breeding), member of the Tropenzentrum between 1981 and 1990, deceased on June 29. 2004, at the

age of 79 years. Prof. Rudolf Stösser (Special Crop Cultivation and Crop Physiology), member of the Tropenzentrum since October 1992, deceased on 24 Sept. 2004 at the age of 66 years. Prof. Dr. Dr. med. Peter Fürst (Biological Chemistry and Nutrition), member of the Tropenzentrum since July 1989, deceased on 11 Dec. 2004 at the age of 68 years. To the Tropenzentrum they will remain in honourable memory.

Board

The board consists of eight professors, two research assistants, one student and the centre's executive manager (without vote). The director of the Centre is elected for a period of two years by the board.

In January 2004 a new board took on its activities. Unfortunately for the Tropenzentrum, the newly elected director, Prof. H.-Rüdiger Korff was offered a post at the University of Passau and subsequently left the University of Hohenheim in September 2004. He was succeeded as director of the centre by Prof. Klaus Becker. (Chair: Aquaculture-Systems and Animal Nutrition in the Tropics and Subtropics). During the member assembly held in December 2005, a new board was elected. On its first meeting in February 2006, this board re-elected Prof. Klaus Becker as director of the centre; Prof. Joachim Müller will again be vice-director.

Advisory board

The advisory board consists of members from both locally and internationally operating governmental and/or private institutions concerned with science and/or development cooperation. The advisory board provides the centre with the critical guidance and support in its strategic orientation, which is crucial for the successful development of such an institution. The advisory board has presently six members. After many years of membership, Senator e.h. e.h. Dr. Dr. h.c. Hermann Eiselen (Eiselen Foundation Ulm) and Dr. Hans-Jörg Lutzeyer (European Commission) left the advisory board. We would like to thank them for their cordiality and outstanding achievements.

Management Unit

The centre's management unit consists of two permanent staff, i.e. the executive manager (full-time position) and one secretary (half-time position). Further staff for the management unit is contracted for coordination and administration of specific activities and projects for which funds have been secured.

Mrs. Andrea Tchitchi born Schaevel, employed at the Ministry for Science Research and Art (MWK), was delegated to the Tropenzentrum from 01.03.2004 - 30.09.2004. She assisted the management unit in the search for sponsors for research projects (European Union programs, BMZ, BMBF, foundations), and helped foreign students to acquire scholarships. Furthermore, she supported the coordination units of the international M.Sc.-courses and took over the task of organising the visits of delegations.

In July 2005, Mrs. Heidi Beinert, left the Tropenzentrum after almost twenty years of

service. Dr. Christian Hülsebusch, executive manager of the centre since January 2001, left the university in October 2005. We would like to thank them for their much valued services at our centre.

Finances

The Tropenzentrum received from the University annual funds of € 129 954,-. The sum received from the university as reward for third party finances obtained in the year before, amounted € 5 820,- in 2004 and € 3 920,- in 2005. On overview of the expenditures of these financial resources can be found in annex 3.

Besides these resources, the Tropenzentrum acquired also financial resources of third parties. The spending of these resources over the last two years is listed in the table below. For every EURO spent by the Tropenzentrum of the resources coming from the university, an other € 5,- could be purchased for Hohenheims tropical and development oriented research and teaching activities.

Financial resources (€)	2004	2005
Incomes from the University		
Univ. Hohenheim budget funds Tropenzentrum	129 954.-	139 954.-
Univ. Hohenheim reward for third party incomes in 2003 and 2004	5 820.-	3 920.-
Univ. Hohenheim co-finance of SFB564	177 443.-	180 001.-
Total contribution of the University	313 217.-	323 875.-
Incomes from third parties		
DAAD AS Program (EnviroFood)	94 000.-	128 927.-
DAAD scholarship and mentor program STIBET II + III	23 750.-	39 720.-
DFG finance of SFB564	1 402 600.-	1 293 700.-
DFG contribution to Tropentag conference		13 970.-
Eiselen Foundation Ulm theses research grants	47 000.-	30 000.-
Eiselen Foundation Ulm scholarship program	25 565.-	30 000.-
Senator Eiselen private engagement Josef G. Knoll visiting professor	109 500.-	126 700.-
GTZ/BEAF contribution to Tropentag conference		15 008.-
Konradin Verlag contribution to Tropentag conference		3 000.-
Total contribution of third parties	1 702 415.-	1 681 025.-
Financial resources from third parties per 1 € of incomes from the University	5.44	5.36

2 Grants and public activities

Eiselen Foundation Ulm

Thesis research grants

The Eiselen Foundation Ulm makes it possible to conduct research in developing countries to complete a bachelor, diploma or master thesis. The research work is conducted in cooperation with national and international institutions and ensures that the students prepare themselves in a practical way for future involvement in development cooperation.

This program has been running since 1982 and has supported so far 420 students. The total extent of the funds amounts to over € 700 000. (1982 to 2005). In the years 2004 and 2005, altogether 44 grants were authorised with a total volume of € 76 147.15. An overview of these supported theses is shown in annex 4, and these can be accounted as:

Research continent	number of theses
Africa	17
Asia	23
Central and Latin America	4

Scholarships for „TropenMaster“

Also in the last two years 2004/2005, the Eiselen foundation Ulm donated a sum of € 30 000,- yearly for scholarships for highly qualified students on the TropenMaster course. These funds make the Tropenzentrum to be eligible to receive so-called “matching funds” of € 25 000,- from the DAAD STIBET programme.

Altogether 11 students have received scholarships for different periods of time.

Public awareness

Upgrading our network

In 2004 and 2005 the Tropenzentrum received guests from several different fields: science, research, development aid, economics, politics and administration. The purpose of these visits varied from just “general interest” to specific project collaborations and university co-operations. These visits serve the purpose of getting people familiar with the Tropenzentrum. But this is also a means of bringing scientists of our university and visitors together for future collaborative projects and can therefore be considered as being just another part of our networking.

Events

How can fair globalisation offer equal chances for everyone? What are the social dimensions and how can these be arranged? A report from the International Labour Organisation ILO is concerned with such questions. How the results of this report could be implemented was the topic of a panel discussion held on October 5th 2004 in the Tropenzentrum. This meeting was organised together with the Global Cooperation Council and the Inter Press Service Europe.

This is one example of a Tropenzentrum (co)organised event, where the objective is to inform the public of actual development co-operation related themes. Our centre intends to reinforce its activities in this field to keep nourishing the debate on the establishment of sustainable development of countries in the southern hemisphere. A good example of this is the interdisciplinary seminar, which was organised in January and February 2006 on “Benefits and risks of the use of genetic engineering for developing countries”.

TROZnews / web presence

In the last two years the Internet pages of the Tropenzentrum www.troz.de were extended. The actualisation and the addition of information take place in the offices of the Tropenzentrum and the SFB564. The technical maintenance of the server is kindly carried-out by the computing centre of the University.

The web presence of the Tropenzentrum is being ever more frequently visited. In January 2004, around 4 300 visits were registered, and towards the end of 2004 this number increased to over 10 000 visits a months. In the year 2005, an average of 11 000 visits per month were counted.

Each request made to our server comes from a unique "site", which can be referenced by a name or ultimately, an IP address. The "site's" number shows how many unique IP addresses made requests to our server each month. This number has increased by more then 40% over the last two years, and shows that the visitor spectrum is increasing. In 2004, ca. 4 100 unique sites were registered per month against ca. 5 100 in 2005.

The "top entry and exit pages" give a rough estimate of which URL's are being used to enter our site, and which last pages were being viewed. The overall trend shows that in the first half of 2004 ca. 23% of the visitors used the home page www.troz.de as the entry address, this number was reduced to ca. 8% during the second half of 2005. This indicates that more and more visitors enter on lower levels our Internet pages, which are most likely routed by the Internet search machines. The top entry and exit page data show that roughly only one out of four visitors use the same entry and exit page. This indicates that most of the visitors search our pages for further information.

Some of the most frequently downloaded documents counted, were the application documents of the master courses (almost 2 500 visitors per year) and the various study information material e.g. the leaflet on scholarships (more then 3 300 visitors per year). Also the annual reports of the Tropenzen-

trum seem to be of interest to many visitors (ca. 3 000 visitors per year). However the most frequently visited web page is the one containing information on the Costa Rica Excursion 2004 (seminar work, final report) with more than 3 700 downloads averaged over the last two years. Also the posters on the "Rainforestation Farming Concept" met with much approval with more than 2 000 overall attendances.

In order to improve the www-presence of our centre, the management unit of the Tropenzentrum would like to receive feedback from its members regarding the contents and the functionality of the troz.de Internet pages. Also, our members are invited to supply the management unit with any information, which they would wish to be put on the Internet.

3 Distinctions, awards and newly appointed professors

Distinctions

Prof. Hartwig H. Geiger, chair for population genetics, is conferred honorary doctor from the Justus-Liebig-University. This university appreciates his outstanding achievements of research and development in the field of population genetics and plant breeding, and his success in training next generation scientists.

Prof. Franz Heidhues, chair for Agricultural Development Theory and Development Policy, was elected chairman of the scientific advisory board of the Federal Ministry for Economic Cooperation and Development.

Honours

On November 17, 2004 the United Nations Development Fund for Women UNIFEM Germany awards were assigned for the sixth time. The second price went to Salato Women's Group from north Kenya (Ngurunit Marsabit District), a co-operation partner of the chair for Animal Breeding and Husbandry in the Tropics and Subtropics. This price was received by Dr. Brigitte Kaufmann and Laura Lemunyete as representatives.

Marc Sporleder, chair for Plant Production in the Tropics and Subtropics, was one of the three price winners of the **Josef G. Knoll 2004 award**. He received this award at the Tropentag 2004 conference in Berlin for his outstanding PhD thesis on "The granulovirus of the potato tuber moth *Phthorimaea opeculella* (Zeller) - characterization and prospects for effective mass production and pest control".

Christoph Reiber was awarded the **Hans-H. Ruthenberg price 2004** for his outstanding master thesis on "Potential and constraints of cowpea (*Vigna unguiculata*) in Honduras hillsides". He was one of the two price winners and he executed its thesis work at the chair for Agricultural Communication and Extension.

Nazaire Sénou Idrissou Houssou was one of the two price winners of the **Hans-H.**

Ruthenberg award 2005. He received this award for his master thesis on "Debt position of developing countries and new initiatives for debt reduction". This thesis work was done at the chair for Agricultural Development Theory and Development Policy.

New professorship appointments

Dr. Georg Cadisch was appointed to a professorship in "Plant Production in the Tropics and Subtropics". Cadisch, born in 1955 in Praez / Switzerland, studied agriculture at the ETH in Zürich where he also earned his doctorate. Afterwards he stayed one year at the Inter-American Institute for Cooperation on Agriculture in Rio de Janeiro, where he continued its work started during his doctoral research. From 1991 onwards he worked at the Imperial College at Wye of the University of London as senior research fellow and as senior lecturer. The research work of Prof. Cadisch is focused on soil fertility related questions, as he sees soil fertility as one of the fundamental conditions for a successful agriculture and a sustainable nutrition of humans in the tropics.

Prof. Joachim Müller succeeded Prof. Werner Mühlbauer as professor for "Agricultural Engineering in the Tropics and Subtropics" in September 2004. Müller was born in 1959 in Kleve / Germany. He studied, did his doctoral promotion and received his postdoctoral qualification (Habilitation) at the University of Hohenheim. From September 2001 till his appointment in Hohenheim he was a full professor at Wageningen University / The Netherlands on the chair "Farm Technology". His major research topics are post-harvest technologies and irrigation technologies. With ten pending patents as well as two international research prizes Prof. Müller proves to be a particularly innovative researcher in the field of tropical agriculture.

PD Matin Qaim holds the chair "International Agricultural Trade and Food Security" since April 2004. He therewith succeeded Prof. Matthias von Oppen. Qaim was born in 1969 in Mainz / Germany. He studied agricultural sciences at the Universities of Bonn and Kiel. For his doctoral thesis "Potential impacts of crop biotechnology in developing

countries" at the University of Bonn he received the Josef G. Knoll Award 2000. On a Emmy Noether scholarship of the DFG, he spent two years (2001-2003) as a visiting research fellow at the Department of Agricultural and Resource Economics of the University of California, Berkeley, USA. Afterwards he was a senior researcher and team leader at the Center for Development Research (ZEF) of the University of Bonn. Here he obtained his postdoctoral qualification (Habilitation) and his *Venia Legendi* in "Agricultural and Development Economics" in December 2003. His major research topics are the economics of biotechnology and agricultural research systems and food security and sustainable development.

Dr. Thomas Berger, junior research group leader of the project "Agent Based Simulation of Sustainable Resource Use in Agriculture and Forestry" of the Robert Bosch Foundation, was appointed Josef G. Knoll Visiting Professor for Development Research in December 2004. He was born in 1966 and studied Agricultural Sciences at the University of Göttingen, where he also obtained his doctorate in February 2000. Between 1999 and 2003, Berger was scientific assistant at the Center for Development Research (ZEF) of the University of Bonn. His major research topics are human dimensions of global change research; water resources management; integrated modelling and assessment, and multi-agent systems.

Prof. Manfred Zeller was appointed to a professorship in Rural Development Economics and Policy as successor of Prof. Franz Heidhues. Born in 1960 in Stuttgart / Germany, he studied agricultural sciences at the University of Bonn. At this same university he obtained a doctoral degree in agricultural sciences in March 1990. Between 1990 and 1999 he worked at the International Food Policy Research Institute IFPRI in Washington, D.C. First as a post-doctoral fellow and afterwards as a research fellow, and as such head of an IFPRI multicountry programme on "rural finances for food security". From September 1999 until he came to Hohenheim, Prof. Zeller held the chair for Socio-Economics of Rural Development at the University of Göttingen.

4 Teaching

4.1 Master of Science Programmes

Agricultural Sciences, Food Security and Natural Resource Management in the Tropics and Subtropics: TropenMaster

Academic head: Prof. Dr. Anne Valle Zárate

Coordination: Sabine Burkhardt (till 31.07.2005),
Kerstin Hoffbauer (since
01.07.2005)

Email: masterpr@uni-hohenheim.de

Internet: www.troz.uni-hohenheim.de

The international Master of Science Programme "Agricultural Sciences, Food Security and Natural Resource Management in the Tropics and Subtropics", called TropenMaster, is now in its 7th year. Established in 1999 as the first Hohenheim M.Sc. programme, it is interdisciplinary and multi-sectoral. The TropenMaster is designed to provide students of all nationalities, scientific training geared up to the challenges of the agricultural development's complex job market including communication, negotiation and implementation. It prepares also for a PhD in the field of life science research in the Tropics and Subtropics.

The programme was originally financed by the DAAD (German Academic Exchange Service) and by the MWK (Ministry of Sciences, Research and Art). At the end of 2003, the external funding expired, and the programme was then continued as a permanent course at Hohenheim. Since it started, the programme has been coordinated at the Tropenzentrum. The management unit of the Tropenzentrum aids the TropenMaster with the administration, the coordination of the financial resources as well as with reporting.

Until the winter semester of 2002/2003 an increasing number of students took part in this M.Sc. programme. Since autumn 2003 the number of enrolments has reduced

drastically due to the tightening up of visa regulations and a lack of financing. However, in recent years the number of admissions increased again, and the 7th batch in 2005 could start at full capacity (40 places).

In December 2005, 63 students were enrolled for the 1st and 3rd semesters of the TropenMaster programme. The figures for the number of applicants, admitted and enrolled since the programme first started are shown in the table below.

In 2005, 127 (7 Europeans and 120 non-Europeans) out of a total number of 194 applicants were granted admission for the winter semester of 2005/2006. From these 41 applicants from a total of 22 different nations have eventually started this master course. The number of temporary students taking part in the TropenMaster programme is also on the increase. Furthermore, as the programme is of short duration, there is a low dropout rate.

For most of the students coming from developing countries a scholarship is absolutely essential due to the high cost of living in Germany. In this context the efforts of the Eiselen Foundation should be highlighted. From 2002-2004 this foundation provided € 25 565.- per year for the TropenMaster students. The Eiselen Foundation even increased its contribution to this scholarship programme to € 30 000.- per year for the period 2005-2007. Based on these financial resources the Tropenzentrum could raise additional matching funds of € 25 000.- per year for the same time period as part of the DAAD Stibet Programme.

Nearly 30% of the students of the 7th batch have been awarded scholarships. Besides the scholarships provided through the Eiselen Foundation / DAAD Stibet programme, further scholarships were awarded. One student from Ethiopia received a scholarship awarded by SIDA, the Swedish International Development Agency. Another applicant from Egypt received a scholarship awarded by the organisation "Sandstorm Cairo".

Overview: Applicants, admissions and enrolments at the TropenMaster 1999 - 2005

Year	applic.	admis.	enrolments										grad.
			total	regions							gender		
		% admis. applic.	% enrolm. admis.	Germany	Europe	USA/ Canada	Far East	Africa	Asia	Latin-America	male.	female.	% grad. of enrolm.
(% regions per enrolment)													
1999	78	53 (68%)	14 (26%)	6 (43%)	1 (7,5%)	1 (7,5%)	0	3 (21%)	3 (21%)	0	10 (71%)	4 (29%)	13 (93%)
2000	107	48 (45%)	24 (50%)	3 (12,5%)	2 (8%)	1 (4%)	3 (13%)	9 (37,5%)	5 (21%)	1 (4%)	15 (63%)	9 (37%)	21 (87%)
2001	164	73 (45%)	39 (53%)	5 (13%)	3 (8%)	0	1 (3%)	15 (38%)	13 (33%)	2 (5%)	22 (56%)	17 (44%)	34 (87%)
2002	233	83 (36%)	41 (49%)	7 (17%)	1 (3%)	0	2 (5%)	19 (46%)	7 (17%)	5 (12%)	27 (66%)	14 (34%)	41 (100%)
2003	263	90 (34%)	33 (37%)	3 (9%)	3 (9%)	2 (6%)	2 (6%)	14 (43%)	7 (21%)	2 (6%)	21 (64%)	12 (36%)	on 12.12.05 32
2004	215	102 (47%)	23 (23%)	6 (25%)	1 (4%)	1 (4%)	0	7 (30%)	5 (21%)	3 (13%)	17 (71%)	7 (29%)	
2005	194	127 (65%)	41 (32%)	4 (9,7)	3 (7,3%)	0	6 (14%)	18 (44%)	6 (14%)	4 (9,7%)	27 (66%)	14 (34%)	

Applic.: applicants; admis.: admissions; enrolm.: enrolments; grad.: graduates

A further student from Cameroon is financed by the EED (The Church Development Service). One Vietnamese student received a scholarship awarded by its government, a student from Jordan is financed through a DFG project, and one Filipino has been awarded a scholarship provided by the Foundation for Environment and Nature Conservation.

In the last 5 years between 20% and 40% of the non-European TropenMaster students have been awarded scholarships.

Each new batch receives a special warm-up programme. This comprises of a two-day intercultural seminar at the "Protestant Academy" in Bad Boll, a sight seeing tour in Stuttgart, a visit to the museum of bread culture in Ulm, as well as the seminar "Studying in Hohenheim - Facts and Skills". This facts-and-skills seminar has become a

fixed part of the programme offered by the central study support group. This two-day seminar provides more detailed information on the students' daily life at the University of Hohenheim, on learning techniques as well as on issues concerning the German Aliens Act. In contrast to the time prior to 2004 the language course "German for Foreign Students" is now being offered as an option throughout the semester instead of before the start of the Master programme.

A special attraction for the 2004 batch was the boat trip on the river Neckar from Stuttgart to Marbach. This initiative was arranged by the "Academy for Nature Preservation and Environmental Protection" Baden Württemberg and it gave the Master students the opportunity to get acquainted with the surroundings of Stuttgart. Besides an interesting tour of various environmental projects in the Neckar Valley there was a

reception at the Marbach City Hall, a visit to the German Archive of Literature and a visit to Schiller's birthplace. As a return gesture an international group of students from Marbach visited Hohenheim in Dec. 2004.

Another event which took place in 2004 was the evaluation of the study programme by the EVALEG and ACQUIN agencies. As a result of this, the study programme was accredited unconditionally for a period of 5 years (until 30.09.2010).

Each year the second semester students attend a seminar in order to discuss the outcomes of an internal evaluation and to discuss how the content and the structure of the programme as well as its concept could be reformulated. The outcomes of these seminars were used for a structural reform that will be implemented in October 2006. It is intended to reduce the number of core modules in order to make specific orientations possible (rural development economics, natural resource management, plant and animal production) while preserving the interdisciplinary character of the course.

Meanwhile, the graduation ceremony for degree holders has taken place for the fifth time. As the number of graduates is continuously increasing, the ceremony now has to be held at the Euroforum in stead of the more beautiful but smaller Aula in Hohenheims castle. This ceremony is intended for all graduates of the M.Sc. and Diploma programmes at the Faculty of Agricultural Sciences. The graduation ceremony is organised by the Faculty of Agriculture and supported by the Tropenzentrum.

Only by maintaining contact with the alumni, information on the career history of Hohenheims graduates is possible. According to a survey relating to the employment situation of all TropenMaster alumni during the first three years after graduation, most of these persons found a subject related job or were continuing with postgraduate studies. 34 out of 55 non-European graduated students have returned to their home countries directly after finishing their studies. The other 21 remained in Germany in order to continue with post graduate studies. Most of the

German graduated students could find jobs in the field of development cooperation or were continuing with postgraduate studies.

At present (2006) the TropenMaster coordination unit is combined with the new international Master programme "Organic Food Chain Management" which has started in the winter semester 2005/2006 as the 4th study programme of the Faculty of Agriculture held in English language.

As a final note, it can be said that the decreasing social support for foreign students is becoming an acute problem, especially regarding student accommodation possibilities.

Environmental Protection and Agricultural Food Production: EnviroFood

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How can we provide for the world's population today without exhausting the natural resources also required by generations to come? This is one of the most pressing problems for us to solve. Food production relies ever more on technical means of production and is already straining our natural resources to their limit. Nevertheless, food production is being intensified and the globalisation of markets is actually speeding up this process. One of this century's major challenges is to intensify food production in a way that is as environmentally friendly and sustainable as possible. The concept of sustainability also includes recycling of waste. Complex problems particularly arise on the periphery of densely populated areas, where competing forms of land use have to be balanced (e.g. settlement, recreation, and waste disposal). In attempts to handle these problems we not only have to consider scientific and technical aspects, but also socio-economic, political and legal ones.

To this end the University of Hohenheim has started in the Winter semester 2002/2003 the M.Sc. programme entitled "Environmental Protection and Agricultural Food Production". This course is designed to provide qualified people of all nationalities with internationally competitive, state-of-the-art training. Graduates will acquire the tools of the trade enabling them to analyse and understand eco-systematical, economic, political and administrative interdependencies and develop integrative solutions to problems. In this context subsidiarity means the education of foreign students as future

junior professionals in their home countries.

The German exchange service DAAD financed this course from its beginning till December 2005. During this time the university started also the process to get the EnviroFood programme accredited. An accreditation was applied last year through the ACQUIN agency.

The coordination unit of EnviroFood is based at the Tropenzentrum and works closely together with the coordination unit of the other international M.Sc. programmes.

Overview: Applicants, admissions and enrolments at EnviroFood 1999 - 2005

year	applic.	admis.	enrolments									
			total	regions						gender		
				Germany	Europe	USA/Canada	near East	Africa	Asian	Latin-America	male	female
2002	40	30	16 (100%)	-	1 (6%)	-	1 (6%)	7 (44%)	6 (38%)	1 (6%)	10 (62%)	6 (38%)
2003	118	46	27 (100%)	4 (15%)	6 (22%)	-	1 (4%)	2 (7%)	11 (41%)	3 (11%)	11 (41%)	16 (59%)
2004	120	56	21 (100%)	3 (14%)	5 (24%)	1 (5%)	--	2 (4,5%)	8 (38%)	2 (4,5%)	12 (57%)	9 (43%)
2005	113	54	27 (100%)	2 (7%)	5 (19%)	-	3 (11%)	5 (19%)	9 (33%)	3 (11%)	15	12

Applic.: applicants; admis.: admissions

From the 56 admitted persons in 2004, only 21 enrolled in the third batch of the EnviroFood programme. Eight of them came from Europe. In October 2005, 27 enrolments were registered. The development of enrolments is certainly due to the fact that the visa regulations of Germany have been sharpened.

Besides the organisation of the day-to-day study programme, executed in close cooperation with the Faculty of Agriculture and the different lecturers, a further focal point of the coordination unit is to identify further key issues for its study programme.

Ten EnviroFood students participated in the spring of 2004 at a so-called Global Seminar, organised by the Cornell University (New York). This seminar is rated equivalent as the compulsory module „Environmental Science Project“. As the experiences were

quite positive, also in 2005 a group of ten students participated at this Global Seminar. In this international seminar, students of different universities work in an interdisciplinary way at environmental case studies. Students come from Manila/Philippines, Guadalajara/Mexico, La Molina/Peru, Florence/Italy, Virginia/USA, Hangzhou/China and from Taiwan. The communication between the groups of students is assured through telephone conferences, „chat-rooms“ in the Internet and video conferences. Further information about this „Global Seminar“ can be found in the Internet www.globalseminar.org.

During the last two years, promotion for this M.Sc. course was made especially in countries of eastern Europe. This was done in close cooperation with the Eastern Europe Centre of Hohenheim and the institutes of Soil Science, and of Economic and Agricul-

tural Policy. Target countries were Poland, Croatia and Hungary. This focus looks very promising, as ten Central and East European countries joined the EU in May 2004, persons from these countries do not need a visa for Germany, and the education level of natural sciences is relatively high in these countries.

Agricultural Economics: AgEcon

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The Master of Science Programme "Agricultural Economics", which is taught in the English language, was inaugurated at Hohenheim in the winter semester 2004/2005. It has replaced the previous German Programme and was modernised and expanded to explicitly include new topics and methodologies. Agricultural Economics examines the use of available resources from farm to fork to meet the needs and desires of present and future generations. Thus, it fits well into the University's food chain concept and complements the other International Master Programmes of the Faculty of Agriculture.

While the other International Programmes at Hohenheim have a clear interdisciplinary agenda, Agricultural Economics is more disciplinary in nature. It emphasises a firm foundation in economic analysis and quantitative methods, to address real-world issues related to agriculture, food and the environment. There is also a clear difference to the Agribusiness Programme, which is offered at Hohenheim in the German language. While Agribusiness has its primary focus on management aspects in the agri-food industry, Agricultural Economics is rather oriented towards policy analysis. Students acquire both the analytical skills and policy background required for strategic positions in government agencies, NGOs, international

organisations and the private sector. The Programme also provides excellent qualification to commence doctoral research and pursue an academic career. Well-trained agricultural economists are experiencing an expanding range of job opportunities, as the sector itself becomes more diverse, global and high tech in nature, and inter-sectoral linkages are gaining in importance.

Although Agricultural Economics also covers aspects related to local agriculture in Baden-Württemberg and other parts of Germany, it has a clear focus on global problems, including issues related to developing countries. Thus, the Programme contributes to Hohenheim's comparative advantage in development-oriented teaching and research. The Faculty of Agricultural Sciences now has four International Master Programmes, so that a large number of courses are offered in English. This further increases Hohenheim's attractiveness for students. Compulsory modules in one programme can be chosen as electives in the other programmes, so that students can build their personal profile according to individual career aspirations.

Agricultural Economics is targeted at students of all nationalities with an above average Bachelor degree in agriculture, economics or other relevant disciplines. One year after the Programme start, there were about 50 students from 21 different countries enrolled, who were selected out of a much bigger number of applications. This demonstrates that there is considerable international demand for this educational concept. The Hohenheim Programme is the first agricultural economics programme of its kind in Germany. In the initial phase, students were admitted twice a year. However, from 2007 onward, admission will be only once a year for the winter semester. The application deadline is July 15 for EU-nationals and March 15 for non-EU-nationals. Agricultural Economics is coordinated in the Tropenzentrum – together with the other International Master Programmes.

Further details are available on the Programme website under:
www.uni-hohenheim.de/agecon.

4.2 Tropen excursion

Excursions to the tropics are one important tool, by which the Tropenzentrum seeks to provide advanced students with a guided hands-on experience. For the first time since 1997 the Tropenzentrum organised again a "Tropen excursion". Under the leadership of Prof. Gerd Weber 20 students and 5 scientists visited in February/March 2004 Costa Rica. During this excursion a particular accent was drawn on the challenges of breeding and biotechnology for plant and animal production. The students were provided an insight to the agricultural production systems in the varied agro-ecological regions of Costa Rica. In this way they became an idea of the production problems involved and their influence on the ecological systems. Such excursions offer opportunities to gain specialised experiences and to confront ones theoretical knowledge acquired during the past study with practical facts on the spot.

This Excursion was financially supported by the German Academic Exchange Service DAAD, Eiselen-Foundation Ulm, Stuttgarter Hofbräu, Universitätsbund Hohenheim AG and the Tropenzentrum. Reports of this Excursion as well as the student preparatory seminars can be consulted on our website: <http://www.troz.uni-hohenheim.de/teaching/Exkursions/CR04>.

The next Tropen excursion will go to Thailand in February/March 2007.

4.3 Tropentag 2004/2005

The Tropentag is the International Conference on Research for Development in Agriculture and Forestry, Food and Natural Resource Management. This is an annual event alternately organised by the Universities of Berlin (Humboldt), Bonn, Göttingen, Kassel (Witzenhausen) and Hohenheim in co-operation with the Council for Tropical and Subtropical Agricultural Research and Development (GTZ/ BEAF) and the German Forum for Research and Development (DFOR).

The Tropentag provides a forum for scientists, experts and students involved in research for development. In 2004 the Tropentag took place in Berlin from 5th to 7th October under the main theme: "Rural poverty reduction through research and development and transformation". More than 500 participants from scientific institutes from Africa, Asia, Europe, and Latin America presented and invited discussion on 205 poster presentations and 114 lectures in a total of 25 scientific sessions. The Tropenzentrum at Hohenheim was represented by over 60 participants (professors, scientific assistants, and students) at this Tropentag.

In 2005 it was the turn of Hohenheim to organise the Tropentag. The theme of this years conference "The Global Food and Product Chain - Dynamics, Innovations, Conflicts and Strategies" was addressed in twenty-two sessions each with five oral presentations and twenty-one guided poster sessions with a total of almost 300 posters. The 524 participants represented 47 different countries.

The impressive number of contributions from scientists in Europe, Africa, Asia, and Latin America underlines the Tropentag's reputation as an international event on the agenda of the development oriented scientific community and decision makers alike.

The proceedings of the last 7 conferences are published on www.tropentag.de.

5 Research

5.1 Sonderforschungsbereich 564 “The Uplands Program“

Speaker: Prof. Dr. Franz Heidhues
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The Special Research Program SFB564 “Research for Sustainable Land Use and Rural Development in Mountainous Regions of Southeast Asia” is the prime interdisciplinary research activity of the Tropenzentrum. The SFB564, also known as the Uplands Program has been in operation since 1st July 2000. Its research locations are in northern Thailand and northern Viet Nam.

The setting: High population growth, resettlement programs and migration have been increasing the pressure on the fragile natural resources in many marginal mountainous areas in Southeast Asia. As a result, we observe vicious circles of natural resource degradation with a shortening of fallow periods, erosion and loss of soil fertility, leading to declining agricultural productivity. These processes often take on self-accelerating speed. As a result, poverty, unemployment and food insecurity are widespread, particularly in regions that are climatically, edaphically, hydrologically, economically and socio-cultural extremely heterogeneous and where complex interrelations between determining factors, causes and effects dominate. Ethnic diversity with politically, economically and socially weak integrated minorities is an additional dimension characteristic for these regions. At the same time, we observe that the urban centres with dynamic trade and manufacturing sectors develop dynamically, thus increasing the gap in living conditions between rural and urban areas.

Objectives of the Uplands Program are to create the scientific base for the development and testing of improved and sustainable production and land use systems with

increased productivity in ecologically fragile and economical disadvantaged mountainous regions in Southeast Asia;

- a) the development of concepts for rural institutions that can contribute to a sustainable reduction of rural poverty, food insecurity and to an improvement of livelihoods in mountainous regions in Southeast Asia; and
- b) advancing methods for analyzing complex ecosystems and their interactions with diverse socio-cultural, economic and institutional environments.

Moreover, the Uplands Program aims at training young scientists in participating countries in methods to properly research the issues to be addressed in upland region and design appropriate measures and policies. It also aims at moving the issues of mountainous regions into the area of high priority in national research programs and to promote interdisciplinary research in all partner institutions.

With these objectives in mind, the concept of the Uplands Program is based on the following hypotheses:

- Scientific research can decisively contribute to conserving natural resources and biodiversity in production systems in the mountainous regions and can provide effective tools to raise productivity and efficiency in the use of natural resources.
- To develop sustainable improvements, research needs to include and work with farmers and all stakeholders concerned with natural resource use.
- Innovations will only have a chance to be accepted by farmers if they are addressing their needs and are economically advantageous and well integrated into the existing farming household systems.

Innovations can only be successful in the long term if they address the needs of the stakeholders and provide adequate incentives to be accepted within the institutional and political framework.

For 16 different projects of which 7 are undertaken in Thailand, 4 in Viet Nam and 5 in both countries, the following disciplines of study are cooperating: soil science and land evaluation, crop science and agro-ecology, fruit science, food technology, animal science, agricultural engineering, agricultural economics and social sciences.

Research partners are eight universities and research institutes. In Thailand: Chiang Mai University, Kasetsart University, Mae Jo University, Silpakorn University. In Viet Nam: Hanoi Agricultural University, Thai Nguyen University of Agriculture and Forestry, National Institute of Animal Husbandry, Viet Nam Agricultural Science Institute.

The SFB564 program is led by Prof. Franz Heidhues (speaker) and Prof. Karl Stahr (deputy speaker), who took over the speaker's chair on 01.01.2006. Prof. Rainer Schultze-Kraft was deputy speaker from the beginning of this SFB till June 2005. The

executive manager is Dr. Jens Pape. The overseas coordinators for Hohenheim are Dr. Andreas Neef (Thailand), and Dr. Harald Leisch (Viet Nam). The coordinators for the local partner institutes in Thailand are Prof. Dr. Pittaya Sruamsiri, who is professor of the agricultural faculty at Chiang Mai University and in Viet Nam Prof. Dr. Nguyen Van Dinh, who is dean of the agricultural faculty at the Hanoi Agricultural University.

In the first three-year-phase (July 2000 – June 2003), the SFB had a financial volume of 3 million euros. For the second phase (July 2003 – June 2006) around 4 million euros were awarded. A preliminary phase, which lasted more than 3 years, was made possible, due to a generous contribution of the Eiselen Foundation and the University of Hohenheim. Accordingly, additional funds from the federal state of Baden-Württemberg, the DAAD (the German Academic Exchange Service) and the Volkswagen Foundation could be mobilised.

Subprojects in Thailand:

A1.2 - Potential and constraints of participatory research approaches for sustainable development in mountainous regions of Southeast Asia

Prof. F. Heidhues, Prof. E. Buss, Dr. A. Neef, Hohenheim & Prof. D. Neubert, Bayreuth, and Assoc. Prof. Benchaphun Ekasingh, Chiang Mai University

B1.2 - Efficient water use of mixed cropping systems in highland watersheds of northern Thailand

Prof. K. Stahr, Dr. L. Herrmann, Hohenheim, and Assoc. Prof. Thanom Klodpeng & Assoc. Prof. Mattiga Panomtaranichagul, Chiang Mai University

B2.2 - Lateral water flow and agrochemical transport: a study of a litchi orchard in northern Thailand

Prof. T. Streck, Hohenheim & Prof. M. Kaupenjohann, Berlin, and Assoc. Prof. Suphot Totragkool & Assoc. Prof. Prasak Thavornyutikarn, Chiang Mai University

B3.1 - Irrigation and fertigation strategies for water saving and optimised nutrient supply of litchi and mango

Prof. V. Römheld, Prof. K. Köller, Hohenheim, and Assoc. Prof. Somchai Ongprasert & Dr. Sakesan Ussahatanonta, Mae Jo University

C1.2 - Analysis and manipulation of the agro-biocoenosis for sustainable management of litchi growing systems in northern Thai hillsides

Assist. Prof. K. Martin, Prof. J. Sauerborn, Hohenheim, and Assoc. Prof. Vichian Hengsawad, Chiang Mai University

D1.2 - Reducing alternation and production of off-season fruits in litchi, longan and mango

Prof. F. Bangerth, Prof. V. Römheld, Hohenheim, and Assist. Prof. Pittaya Sruamsiri, Chiang Mai University & Assist. Prof. Pawin Manochai, Maejo University

E1.1 - Mathematical modelling of the drying process of tropical fruits including the kinetics of quality decisive attributes

Prof. W. Mühlbauer, Prof. R. Carle, Hohenheim, and Assist. Prof. Methinee Haewsungcharern, Chiang Mai University & Assoc. Prof. Serm Janjai, Silpakorn University

E2.2 - Contributions of expanded raw material availability and waste utilisation to sustainable fruit processing in the tropics and subtropics

Prof. R. Carle, Dr. S. Neidhart, Hohenheim, and Assist. Prof. Pittaya Sruamsiri, Chiang Mai University

F1.2 - Tenure and economic valuation of common-pool resources in mountainous regions of Thailand – The case of water resources

Prof. M. Ahlheim, Prof. F. Heidhues, Dr. A. Neef, Hohenheim, and Assoc. Prof. Benchaphun Ekasingh, Dr. Chapika Sangkapitux, Dr. Jirawan Kitchaicharoen & Dr. Anan Ganjanapan, Chiang Mai University

F3.2 - Development intervention, state administration and local society: Conditions for political participation in the highlands of northern Thailand

Prof. R. Korff, Dr. H.-D. Bechstedt, Hohenheim, and Dr. Anan Ganjanapan, Chiang Mai University & Dr. Prapinwadee Sirisupluxuna, Dr. Nuchanata Mungkung, Kasetsart University

G1.1 - Assessment of innovations and sustainability strategies at farm household and regional level

Prof. J. Zeddies, Prof. R. Doluschitz, Hohenheim, and Dr. Suwana Praneetvatakul, Kasetsart University

Subprojects in Viet Nam:

A1.2 - Potential and constraints of participatory research approaches for sustainable development in mountainous regions of Southeast Asia

Prof. F. Heidhues, Prof. E. Buss, Dr. A. Neef, Hohenheim & Prof. D. Neubert, Bayreuth, and Assoc. Prof. Nguyen The Dang, Thai Nguyen University of Agriculture and Forestry

C2.2 - Rehabilitation of barren hills: Improvement of communal grazing lands

Prof. R. Schultze-Kraft, Hohenheim, and Dr. Le Quoc Doanh, Viet Nam Agricultural Science Institute & Dr. Nguyen Thi Mui, National Institute of Animal Husbandry

D2.2 - Efficiency of smallholder animal husbandry depending on management intensity and livestock genetic potential in mountainous regions of northern Viet Nam: Development of community driven breeding programmes using genotypes with high productive adaptability

Prof. A. Valle Zárate, Dr. B. Kaufmann, Hohenheim, and Dr. Le Thi Thuy, Prof. Le Viet Ly, Prof. Nguyen Dang Vang, National Institute of Animal Husbandry

D4.1 - Livestock parasites and parasitic zoonoses in smallholder farming systems of northern Viet Nam

Prof. U. Mackenstedt, Dr. M. Merli, Hohenheim, and Assoc.-Prof. Phan Van Luc, Hanoi Agricultural University & Mr. Nhu Van Thu, National Institute of Animal Husbandry

D5.1 - Analysis of nutrient flow in resource-limited aquaculture systems in northern Viet Nam

Prof. K. Becker, Dr. U. Focken, Hohenheim, and Assoc.-Prof. Nguyen Thi Luong Hong, Vo Quy Hoan, M.Sc., Hanoi Agricultural University

F1.2 - Tenure and economic valuation of common-pool natural resources in mountainous regions of Viet Nam - The case of communal grazing land and aquaculture

Prof. F. Heidhues, Prof. M. Ahlheim, Dr. A. Neef, Hohenheim, and Assoc.-Prof. Pham Van Dinh, Hanoi Agricultural University

F2.2 - Risk management of farm households in northern Viet Nam

Assist. Prof. G. Buchenrieder, Prof. F. Heidhues, Hohenheim, and Prof. Pham Thi My Dung, Hanoi Agricultural University

F3.2 - Development intervention, state administration and local society: Conditions for political participation in the highlands of northern Viet Nam

Prof. R. Korff, Dr. H.-D. Bechstedt, Hohenheim, and Assoc. Prof. Dao Chau Thu, Hanoi Agricultural University

G1.1 - Assessment of innovations and sustainability strategies at farm household and regional level

Prof. J. Zeddies, Prof. R. Doluschitz, Hohenheim, and Dr. Dang Kim Vui, Thai Nguyen University of Agriculture and Forestry

After the first phase of the Uplands Program where the main emphasis was placed on laying the foundations for the research activities in the field, the **second phase**, in building on these foundations, focused on researching complexities and interactions within project areas and preparing them for interaction in models. At the same time, phase 2 research achieved directly applicable important results. In this **summary**, emphasis will be placed on those results that involve several sub-projects that are methodologically innovative and are of particular relevance for policy formulation. It should be noted that many of these results are due to the integrated structures of the Uplands Program and to the cooperation of different disciplines.

The research sub-projects in the area **soil, water, nutrient flows** (B1.2, B2.2 and B3.1) together with the fruit tree component (D1.2), have developed key parameters and process interaction for modelling water balance and water and energy saving irrigation and fruit tree management practices in Thailand. Parameters turned out to be relatively homogeneous in one location, but show a great variation between different locations. These results are important for developing models and methods for upscaling and wider application, to be tested and tried in Phase III in Thailand and Viet Nam respectively. The major project continues to follow a relay

upscaling procedure successfully pursued in Phase II. Project B1 followed this procedure by working in the first phase on plot and field scale continuing in the second phase at catchment level and is now in the third phase moving to the regional scale. B2 followed in the first phase at the plot scale, has arrived in the second phase at the field and mini-catchment scale and will now continue in Phase III with the whole Mae Sa catchment. B3 has started in the second phase with the plot scale approach and will now continue at the field scale in the upland.

The **ecological impacts of intensified land use** in highland regions focusing on the presence and abundance of natural enemies of pests and pollinators and on the interactions between management measures, attendant vegetation, pests and arthropods and landscape structure in an intrinsic system approach has been researched in C1.2. Important research results indicate that chemical pest control will be of limited effectiveness, as long as individuals of pest populations in the orchard are replaced by immigrants from adjacent habitats. Successful pest management requires system modifications which include transformations of the understorey vegetation and the surrounding landscape, which need to be considered in relation to the temporal and spatial movement patterns of pests and their antagonists. Moreover, a control of the major pests can

not be accomplished by these measures alone, but requires an integrated approach.

Reducing **alternate bearing of fruit trees** (D1.2) has been successful with longan (by applying $KClO_3$) and mango (by using PBZ and possibly Prohexadione-Ca). This enabled the investigation of the regulatory mechanisms of flowering such as acquisition and distribution processes of external compounds, enzyme activities, influences between hormones and their manipulation. Understanding these processes is important for developing environmentally friendly crop manipulation methods that will reduce seasonality of fruit bearing and promote regular bearing behaviour with less (or without) application of agrochemicals. Results of the research in Thailand will provide important inputs into the fruit tree research in Viet Nam in the planned phase III.

Given the high heterogeneity of **livestock production in smallholder mixed farms** in the uplands, which D2.2 investigated in phase II, reflecting the large diversity in availability and quality of production conditions, economic environments and ethnic composition the planning and management concept of breeding programs needs to integrate location specific factors. Building on these research results D2.3 aims at designing optimal breeding and management programs involving farmers as active participants in the research process for four typical combinations of production systems and livestock species/genotypes. Research of fish production in the prevailing aquaculture systems revealed extremely low-intensive production systems. Farmers use biomass from leaves and crop residues for feeding and spend, other than buying the fish fry, no funds on external inputs; labor is their main input factor. Fish diseases and lack of feed have been identified as key constraints. Based on understanding the current aquaculture system and its constraints the effects of improved pond and water flow systems, supplemental feeding and interactions with farms cropping activities have to be investigated.

A key objective of **processing, product quality, and marketing** (project area E) is to

increase productivity, reduce post-harvest losses and raise product quality in small- and medium-sized local enterprises. While E1.1 studied the optimisation of small-scale fruit drying and thus helped farmers to access distant markets through microbiologically stabilized product forms, E2/E2.2 focused on industrial fruit processing, particularly into fluid products, with integrated recovery of valuable components from processing wastes. This helps to open a broad range of options for the use of various quality types and size classes of raw fruits in addition to fresh fruit marketing. Concomitantly, optimised fruit products for various markets have been aimed at, as local industrial fruit processing has mostly been oriented towards export markets. Focusing on fresh fruit markets, market access was shown by E3 to increase agricultural productivity. On the whole, project E3 improved the understanding of the dynamics of market-induced growth, and contributed to planning regional development.

Research on **institutions and policies** aimed at generating the scientific basis for innovations that will help to protect natural resources, to promote sustainable land use and to guarantee mountain people, particularly the poor, a fair access to resources. Methodologically, F1.2 in empirically employing the Contingent Valuation Method (CVM) and combining it with participatory assessment techniques found that participatory techniques can improve the quality of CVM mail surveys to such an extent that they can replace the far more expensive face-to-face surveys using personal interviews. In the third phase F1.3 aims at upscaling and adapting the methodological approach introduced in phase 2 to a broader socio-economic context of Thailand. The institutional research of F1.2 in Thailand identified the complexity of water rights (control, ownerships and use) and their interaction with land and forest rights and, together with the NRCT-funded component, designed a balanced policy mix of rights-based and value-based measures that can help to reduce water conflicts and to internalise externalities of excessive and inappropriate water use. In Viet Nam, F1.2 found wide spread uncertain-

ties and institutional constraints in adopting prevailing common property systems to the new land allocation process. It also helped to clarify different forms of water and pasture tenure and management systems. In systematising different forms of tenure and in outlining the heterogeneity and complexity of tenure systems a key conclusion of F1.2 is that within this framework village/commune specific studies are necessary for designing appropriate interventions and policies.

Rural credit policies in Viet Nam (F2.2) were found to have achieved that rural credit is reaching a substantial part of the uplands people, even in remote areas. However, the poorer section of the rural clientele is still lacking access to credit markets. More poverty focused approaches and policies are needed which will be the focus of F2.3 in the third phase. Also insurance, besides savings and credit the third cornerstone of rural finance, requires more research and policy attention, if the rural poor and most vulnerable groups are to be assisted by rural finance; an associated research project plans to address these issues in Phase III.

Building on research results of Phase 1, i.e. that local groups (villagers, developments workers, state officials) form a compromise in bringing their different interests to bear in networks among hill tribes, F3.2 studied the **conditions for political participation** within these networks. Research found confirmed that institutional structures are at the same time medium and outcome. Thus, external factors (new policies, changing social values, economic forces) have shaped new processes of structuration that have resulted in changes of institutional structures. A coexistence of institutional patterns, at times an uneasy one, of informal traditional highly personalised patron-client relations with formalised, less hierarchical impersonal patterns could be observed. At the same time, these institutional changes have effected the external environment as new actors are entering the field (a new economic and bureaucratic elite) and others are being disempowered.

A continuously growing population, particularly in fragile areas, with low income of

farms has led to excessive use and degradation of natural resources. These farms depend vitally on innovations and improvements in sustainable management of resources and increased productivity. Sub-project G1.1 has analysed and modelled these often extremely complex **farming systems** in their economic context using and integrating the results of the natural science sub-projects. On this basis the potential impact of agricultural innovations on the economic and environmental sustainability of farming systems in the mountainous areas of northern Thailand and northern Viet Nam will be investigated in Phase III. The focus will be on the use of simulation models to disentangle real-world complexity in farming systems and to support policy decision-making with quantitative information. So far, two types of computer models were developed: mathematical programming models and multi-agent system models following the companion modelling approach. It was shown that companion modelling, which employs participatory simulation sessions and progressive development of the multi-agent system, is capable of promoting a shared representation among local stakeholders with different points of view. In the next phase research will combine both model approaches in an agent-based model system in which each agent's decision-making is represented by an individual mathematical programming model. This decision model will be integrated with biophysical models developed in the natural science project areas to build a dynamic and integrated resource-use model.

A central position in the Uplands Program is taken on by sub-project A1. It has the task **to advise and support other sub-projects in carrying out participatory research** involving also local stakeholders and secondly to analyse the **potential and limits of participatory research** in the context of a trilateral collaboration between researchers, farmers and other local stakeholders. Support for other sub-projects has focused particularly on surveying and integrating local knowledge into research work on soil and water conservation (B1.2), on irregular bearing of fruit trees (D1.2) and on biodiversity (C1.2). The

local knowledge input of farmers and stakeholders into those projects and its validation turned out to be extremely valuable. It has turned out that the permanent interaction with farmers and local stakeholders and the explicitly stated or implicitly present questions “what are the benefits for the farmers?” act as a continuous incentive to keep the research work focused on farmers’ problems. It has also been proven that blending local and scientific knowledge can be valuable in improving research output and open up new research approaches that are innovative and cost effective. In evaluating participatory research, applying the model AFAPAR (**A**nalytical **F**ramework for **A**ssessing **P**articipatory **A**gricultural **R**esearch) developed in Phase I, sub-project A1.2 found that the potential for participation varies by discipline and stage of the research process and experience with participatory research. Thus, natural scientists tend to adhere to researcher-controlled experiments. Farmers’ participation can best be initiated in complementary farmer-managed experiments. In Phase III sub-project A1.3 will focus on determining the requirements for upscaling and out-scaling local knowledge combined with research results of sub-projects in the research area B and C.

The mountainous regions pose a demanding and new challenge for agricultural science. As complex systems, where ecological, agricultural production, technological, economic and socio-cultural processes interact and influence each other, they require an **innovative interdisciplinary and participatory research approach** involving various disciplines and stakeholders as well as **cooperation with policy decision and implementing institutions**, as the ‘Denkschrift’ of the German Science Foundation “Perspectives of Agricultural Science”¹ emphasizes. In line with this ‘Denkschrift’ the SFB follows a 4-dimensional research process: First, several disciplines covering the full spectrum of issues to be addressed need to be involved. Second, they need to work in

interdisciplinary approaches where the interactions between some disciplines are particularly close and interconnected: In the SFB564 these are grouped together in research fields. Third, local farmers and their intimate knowledge of the environment in which they live need to be brought into the research process; this has proven to be extremely enriching and valuable for the SFB’s research work. Fourth, interaction with international research centers, such as CGIAR centers, national research and policy implementation institutions, extension services and local authorities and institutions is actively sought and has been successfully instituted. To involve young scientists in this process, train them in and expose them to truly multi-, interdisciplinary and participatory approaches with involvement of local institutions and stakeholders has yielded surprising results. A number of them are determined to integrate into their future work and career interdisciplinary, interactive and participatory perspectives. This augures well for solidly integrating these approaches into agricultural science in the future.

Apart from the **scientific objectives** of producing high quality and relevant research results for mountainous regions in Southeast Asia – so far, more than 200 peer reviewed publications have been issued - the Uplands Program has been able to establish itself as an important research program with substantial impact on teaching, research priority setting and funding allocation within the University of Hohenheim and in the partner countries. The partner institutions involved and high officials in government and research organisations highly value and support the Uplands Program. NRCT in Thailand has selected the Uplands Program as a model for highland research and recommends it throughout Thailand as an innovative approach to research complex systems and to international research partnerships. It has substantially expanded and, in fact, doubled its funding (to € 400 000 equivalent) in the coming phase for the SFB complementary research program of the Thai partner institutions. MOST in Viet Nam, after funding difficulties in 2004 and 2005 has now decided to support the complementary re-

¹ Deutsche Forschungsgemeinschaft (2004): Perspektiven der agrarwissenschaftlichen Forschung. Denkschrift, Bonn, November 2004.

search program in Viet Nam with priority, after a highly competitive process for extremely limited funds with an amount of € 55 000 equivalent. The Uplands Program is also seen as a **pilot project for an intensive research cooperation** between Germany and the partner countries.

The Uplands Program has also been able to provide **important inputs into teaching activities** in the partner institutions. So far 63 PhD and habilitation theses are under preparation and 19 have been completed within the framework of the Uplands Program; in addition, 93 B.Sc. and M.Sc./Dipl. theses were written under the SFB. Methods and research approaches are being discussed and absorbed in teaching courses; master theses are being prepared within the framework of Uplands Program projects and the Hanoi Agricultural University, for example, has rented a house in the project area in Yen Chau where master students can be accommodated during their field work. Within the framework of the Uplands Program, many scientists have been able to participate in scientific workshops and symposia in Germany, Thailand, Viet Nam and elsewhere. The Uplands Program enjoys the **full support of the participating institutions** documented by providing amply offices, meeting rooms, laboratories and other facilities as needed.

Cooperation within the Uplands Program and with the partner institutions is reflected in a series of seminars, training courses, workshops and scientific symposia. Particular emphasis deserves the Regional Conference on “Sustainable Land Use in Mountainous Regions of Southeast Asia – Meeting the Challenges of Ecological, Socio-economic and Cultural Diversity” held in Hanoi in September 2004 and the **International Symposium** “Towards Sustainable Livelihoods and Ecosystems in Mountainous Regions” held in Chiang Mai in March 2006. About 250 scientists attended this important symposium. This follows the first International Symposium “Sustaining Food Security and Maintaining Natural Resources in Southeast Asia – Challenges for the 21st Century” held in Chiang Mai in January

2002, the latter initiated and particularly supported by the Eiselen Foundation Ulm. There were also internal seminars discussing and promoting interdisciplinary cooperation as well as the planning workshop for the third phase held in Hohenheim in July 2005.

The SFB564 issues a regular newsletter, which reports the status of the ongoing research at the various international locations. The newsletter, as well as further information is available on the Internet website: www.troz.uni-hohenheim.de/research.

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5.2 Thematic group I Plant production and landscape ecology

Special:

Even plants leave fingerprints – Diversity studies in tropical legumes

In 1984, Professor Sir Alec Jeffreys of Leicester University (Great Britain) developed a method which allowed, for the first time ever, to identify individuals at the molecular level with the aid of a reliable identification system. Jeffreys's experiments dealt with the evolution of the human protein myoglobin. After isolating and neutralising in a number of persons those parts of the genes (DNA) that are responsible for myoglobin production, he separated these according to size and obtained for each person a specific banding or marker pattern. These individual patterns reminded him of the unique skin contours present on our fingertips. From this point on he referred to such individual patterns as genetic fingerprints. Nowadays these methods are applied, for example, in paternity tests and to convict criminals. Not only can the genetic fingerprint be used for the identification of human individuals but also for the genetic characterisation of living organisms in general.

In plants, genetic fingerprints are used, for example, to determine genotypes in variety protection issues, in marker-based selection, and to prove genetic modifications. Furthermore, they represent an effective method of documenting genetic diversity (variability in genetic composition) of plant populations. In the Section "Biodiversity and Land Rehabilitation in the Tropics and Subtropics", genetic fingerprints are applied by the research group composed of Elke Fischer, Tanja Berndt, Bettina Heider, Meike Andersson and Rainer Schultze-Kraft for diversity studies in wild tropical legumes.

In most regions of the humid and sub-humid tropics, soils are of low natural fertility. Due to ever shorter fallow periods in many cultivation systems, ever more nutrients are removed and soil productivity declines rapidly. Because of their adaptation to infertile soils and their capability of symbiotic nitrogen fixation, the legumes investigated by the research group can make an important contribution to the preservation of soil fertility. Moreover, they represent an essential



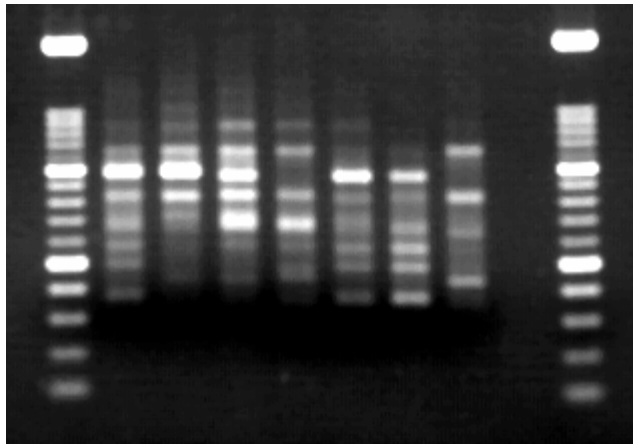
Forage legume (Centrosema spp.) under grazing in a "protein bank"

factor for human and animal nutrition, especially for protein supply that is insufficient in many tropical regions.

The goal of the research group's work is to describe the genetic diversity, through fingerprint analysis, of a number of wild, potential forage legume species that have shown ability to improve soil quality, and to find means as to how existing variations can be put to use for further investigations and be preserved for future generations.

For this, seeds are collected in the wild from many locations of origin and natural distribution. Seeds from each location are recorded as one accession and catalogued according to the so-called passport data (taxonomic features, collecting site description, collector's data etc.).

Seeds are then sown in the glasshouse at Hohenheim and DNA is extracted from the leaves of young plants. With this DNA, fingerprints in the form of banding patterns of the individual accessions are produced. In general, various processes can be applied. Since the legumes investigated are almost exclusively species for which no information concerning their genetic



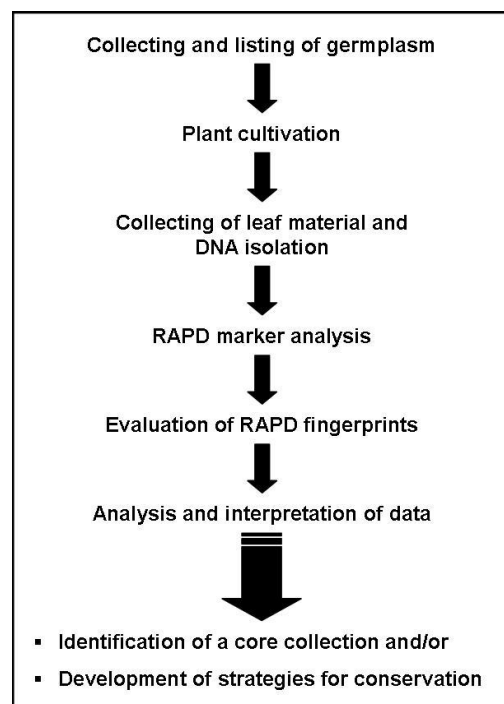
RAPD marker fingerprints of Tadehagi triquetrum (Desmodieae)

composition is available the Random Amplified Polymorphic DNA method (RAPD) is applied. This method, developed in the early 1990s, allows the analysis of genomes without any prior knowledge of the DNA sequence. During the next step the created fingerprints are evaluated: The more bands are shared by two accessions, the more similar or related are the accessions; and vice versa, the fewer bands are common to two accessions, the more genetically different they are. In this way, on the one hand genetically identical accessions ("duplicates") or very similar accessions can be identified.

On the other hand, genetic fingerprints enable also the identification of such accessions that show an unusual or unique genetic composition.

When all data have been evaluated and analysed, the existing number of accessions can be reduced to form a so-called core collection. Ideally, a core collection represents the total genetic diversity of the initial collection, albeit in a significantly reduced number of accessions. As a result, further investigations will be simplified and require less resources.

Using fingerprints and collecting-site information, areas that host a particularly high genetic diversity can be identified and strategies to conserve genetic resources not only of actual but also of potential future value can be developed. Such conservation of plant genetic resources is of particular significance for small farmers in tropical regions: In view of decreasing soil fertility and changing climatic conditions, sustainability of smallholder production systems will depend on the availability of a broad plant genetic diversity.



Flowchart of RAPD analysis of tropical legumes

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The thematic group I „Plant production and landscape ecology“ consists of 43 persons (Annex 2).

Institute for Plant Production and Agroecology in the Tropics and Subtropics

Chair: Plant Production

Head: Prof. Dr. Georg Cadisch

Meeting Future Challenges ...

In times of **Global Change** an isolated examination of land use systems is no longer possible. Crop production systems have to be assessed in a holistic way, considering production issues, people's livelihoods and environmental quality. Growing public awareness of negative impacts of agriculture on the environment when using non-sustainable systems requires a strong scientific analysis of these topics. Simultaneously, **Global Climate Change Feedbacks** such as extreme weather conditions and elevated CO₂ in the atmosphere have a direct effect on crop production itself, crop quality and plant-soil-environmental interactions.

Research topics:

- Agronomic and **ecophysiological** issues (incl. underutilized and alternative crops such as fibres, biofuels).
- **Nutrient cycles, carbon sequestration** and **environmental impacts** of plant-animal production systems with specific consideration of *N₂ fixing legume* based approaches.
- **Trade-offs** between optimal crop production methods and environment (e.g. greenhouse gases).
- **Competition** (light, nutrients, water) and **complementarity** in mixed systems (agroforestry, intercropping).
- Impact of **elevated pCO₂** on soil-plant atmosphere.

Current projects:

- Smallholder agroforestry for degraded soils (SAFODS): Potential of timber based hedgerow intercropping in SE Asia (EU-INCO); The Philippines.
- Trees, resilience and livelihood recovery in the Tsunami-affected coastal zone of Aceh and North Sumatra (Indonesia): Rebuilding green infrastructure with trees people want, EU – ASIA PRO ECO II B Post-Tsunami Programme; Indonesia.
- Biogeochemical processes in tropical soils; Venezuela.
- Development of a modelling system for prediction and regulation of livestock waste pollution in the humid tropics, Malaysia.
- Linking soil fertility and improved cropping strategies to development interventions; Kenya.
- Spatial-temporal management of nutrient resources by small-holders farmers in Zimbabwe: a participatory and technological assessment at the village scale.
- Nitrogen losses by erosion and leaching in hillside cropping systems of northeast Thailand as affected by soil conservation measures; Thailand.
- Organisation and moderation of an international training course.

Under the technical supervision of the Plant Protection Service (AGPP) of the FAO and in close collaboration with ICARDA, Dr. A. Elzein, Alexander-von-Humboldt-Foundation stipend has been selected as an international expert to conduct a training course on biological control of the parasitic weed *Orobanche*. This training course was organised by the FAO within the framework of the regional project TCP/INT/3004, and held in Rabat, Morocco, 27-29 September 2005. The project was designed and based on Training of Trainers (TOT) and Farmer Field Schools or similar experimenting farmers groups (FFS) established for an effective implementation of Integrated *Orobanche* Management Practices.

Chair: Biodiversity and Land Rehabilitation

Head: Prof. Dr. Rainer Schultze-Kraft

The current research programme comprises field projects in Latin America and Africa, and laboratory projects in Hohenheim, in the following thematic areas:

- Characterisation and conservation of plant biodiversity, with emphasis on potentially useful plants.
- Genetic resources of multi-purpose legumes.
- Use of forage legumes in integrated production systems.
- Plant resources for land rehabilitation.

During 2004/2005 the following research projects were still ongoing or final reports on these projects were produced:

- Understanding land degradation and developing rehabilitation techniques for degraded landscapes with a focus on the humid tropics (Cameroon).
- Farmers' perceptions of *Imperata cylindrica* and *Chromolaena odorata* fallows in the North-West, South-West and Littoral provinces (Cameroon).
- Development of strategies to promote farmer utilisation of herbaceous legumes for natural resource management and improvement of farm income and food security in West Africa (Benin, Nigeria).
- Assessment of legume diversity for genetic resources preservation and sustainable land use in the highlands of North Viet Nam (Hohenheim).
- Characterisation of wild legumes by molecular markers (Hohenheim).
- Biogeography of the tropical forage legume *Centrosema brasilianum* (Hohenheim).
- Characterisation and rehabilitation of barren hills (North Viet Nam).
- Phytoremediation of petroleum-contaminated soils (Venezuela).
- Biodiversity and biogeography of *Centrosema* (DC.) Benth. (Fabaceae) (Venezuela).

- Biogeography of the tropical legume genus *Stylosanthes* (Venezuela).
- Demand-driven use of forage innovations in fragile, long dry season environments of Central America to improve livelihoods of smallholders (Honduras).
- Core collection approaches in the multi-purpose legume shrubs *Flemingia macrophylla* and *Cratylia argentea* (Colombia).
- Research and development of multipurpose forage legumes for smallholder crop-livestock systems in the hillsides of Latin America (Colombia).
- *Brachiaria* hay and silage as improved feed options for Latin American smallholders (Colombia).

Chair: Agro-Ecology

Head: Prof. Dr. Joachim Sauerborn

Agro-ecosystems are those ecosystems which have been established and manipulated by man to serve his own needs. Our research activities aim at designing diversified, self-sustaining, low-input and resource-efficient agricultural systems with a high but sustainable level of productivity. To reach this goal it is necessary to acquire knowledge on quantity and quality of the biotic and abiotic factors, i.e. to identify key processes in the regulation of agro-ecosystems. Based on a better qualitative (what happens? or does anything happen?) and quantitative (how much happens? or how does it happen?) insight, sustainable management practices and pest regulation options can be realised.

The research priorities of the chair for Agro-Ecology are:

- Interactions and functional diversity of arthropods in communities of tropical and subtropical cultivated landscapes and their significance for the productivity of agro-ecosystems. <http://www.troz.uni-hohenheim.de/research/SFB564>
- Development and application of simulation models for quantitative assessment of productivity and sustainability of Mediterranean cropping systems based on

biotic and abiotic indicators. Among other things we aim on efficient use of water resources and a more effective control of parasitic weeds.

- Development of innovative methods for parasitic weed management and biochemical and molecular investigations of host-parasite interactions.
<http://www.uni-hohenheim.de/www380/380b/science/supraregional/>
- Rainforestation farming - a concept for the restauration of degraded areas in the humid tropics using indigenous tree species and integrated cultivated crops.
<http://www.troz.uni-hohenheim.de/innovations>
- Use of ecological sanitation products in tropical agriculture to enhance crop production and mitigate soil degradation. A pilot scheme at Valley View University, Accra, Ghana, where we use modern sanitary practice to make available marketable products (fertiliser and irrigation water) in stead of waste materials.
<http://www.uni-hohenheim.de/respta/>
- Conservation of cultural landscapes through diversification of resource use – strategies and technologies for agroecosystems in mountainous Southwest China.
- Analysis of the geographical range of parasitic weeds of its determining factors, and of the potential distribution of these organisms under current and predicted future climate.

Institute for Soil Science and Land Evaluation

Chair: Soil Science and Petrology

Head: Prof. Dr. Karl Stahr

The Institute for Soil Science and Land Evaluation participates in the special research project Uplands Program “Research for Sustainable Land Use and Rural Development in Mountainous Regions of Southeast Asia”. The subproject B1.3 “Water conservation scenario development at the regional level based on innovative mapping

techniques” deals with an upscaling of water balance components in mixed cropping systems (i.e. fruit trees and cover crops) at different scales (i.e. plot, field and watershed scale, upscaling to regional applications). Until now, water balance measurements have been carried out at the plot scale. Major tasks in phase 2 are the further development of a database on natural resources, testing new approaches for resource surveys, and an upscaling of water balance components in watersheds including mixed cropping systems.

The DEKLIM project (Deutsche Klimaforschung) deals with the estimation of the source potential of different land surfaces for mineral dust in Africa using the regional approach, which includes the Saharan and Sahelian landscapes of Niger and Chad. The primary aim of the project is to improve the input parameter of both regional and global climate models for radiation relevant crust-rich type aerosol. For this purpose, the existing SOTER database will be extended and a soil surface systematisation will be developed on the basis of monitored classified satellite pictures. By the use of wind tunnels at the local sites, attempts will be made to quantify the potentially eroded dust quantities as well as to model their transport on the regional level. Furthermore, the geochemical, morphological, and mineral consistence of dust particles will be described.

Since 2004 the EU funded research project RIVERTWIN (A regional model for integrated water management in twinned river basins) develops a model to assist river basin authorities in Benin Republic and Uzbekistan in the strategic planning of water and land resources management (www.rivertwin.de). The consortium is composed of universities and SMEs from Europe as well as the Interstate Commission for Water Coordination in Central Asia and the Ministry for Energy, Mining and Water Resources of Benin. In this project the Institute for Farm Management, chair: Production Theory and Resource Economics is also participating.

The CIMMYT project "Facilitating the widespread adoption of conservation agriculture in maize-based systems in Eastern and Southern Africa" currently operates in collaboration with the Universities of Hohenheim and Bonn, supported by the BMZ, in Zimbabwe, Zambia, Malawi and Tanzania. It explores methods to catalyse innovation systems focused on farmer experimentation with Conservation Agriculture (CA). It is a holistic project that includes many, if not all, of the facets considered necessary to achieve the adoption of complex technologies: stakeholder and farmer participation; researcher and extension agent capacity building; farmer and community awareness building; on-farm research and demonstration; GIS defined recommendation and extrapolation domains for component technologies; equipment validation and modification and the stimulation of local equipment manufacture. These activities are supported by longer-term researcher-managed system trials to determine the effects of CA on soil physical, chemical and biological fertility, socio-economic studies on the impacts of the technologies on farmer livelihoods, perceptions and attitudes, and PhD and Master student studies on soil heterogeneity, biological activity and labour use in conventional and conservation systems. Activities are undertaken with multiple national partners including NARS and NGOs. A postdoc from the Institute for Soil Science and Land Evaluation is directly involved in all soil related on station and on farm research and demonstration activities in Zimbabwe and Zambia. A master thesis on soil heterogeneity was finished in 2005. Furthermore, the University is involved in training a PhD student in the Institute for Agriculture Economics.

The following research projects with a tropical background have been carried out in the years 2004/2005:

- water, energy and nutrient production of fruit trees in the hillsides of northern Thailand;
- emission of mineral dust and its qualities in soil/atmosphere: medium-term fluctuations and future development;
- nutrient crops in surface and ground water, regional crop potentials in the catchment area of Queme (Benin);
- impact of a long-lasting reduced land use on local capacities of different soil in southern Africa;
- local capacities for breeding cotton in central Benin;
- water balance and nitrogen illuviation on the regional level in the lowlands of northern China;
- ploughless farming in eastern Africa (Zimbabwe, Uganda).

Chair : Biogeophysics

Head: Prof. Dr. Thilo Streck

This chair deals primarily with the measurement and mathematical modelling of physical, but also biological and chemical processes of agro-ecological systems. In doing so, the focus is on the transportation and production of environmental harmful chemicals. In the field of our applied research, the main concern is to determine quantitatively and at an early stage, the effects of already implemented or planned interventions on certain properties (e.g. soil, plants, ground water, and health).

The following tropical oriented research projects have been carried out in the years 2004/2005:

- Effect of long-term irrigation with treated wastewater on sorption of hydrophobic organic contaminants by soils: the role of kinetics. In cooperation with B. Chefetz, the Hebrew University of Jerusalem, Israel. This project is completed.
- Lateral water flow and agrochemical transport: a study of a litchi orchard in northern Thailand – Subproject B2.2 SFB564, in cooperation with the Chiang Mai University, Thailand.
- A new method for the simultaneous measurement of gross nitrification and denitrification rates in agricultural soils - subproject 1.5 in the International Research Training Group "Modeling Mate-

rial Flows and Production Systems for Sustainable Resource Use in Intensified Crop Production in the North China Plain", in cooperation with the Chinese Agricultural University, Peking.

Institute for Landscape and Plant Ecology

Chair: Landscape Ecology and Vegetation Science

Head: Prof. Dr. Reinhard Böcker

This chair deals with the analysis and modelling of landscapes. As well as working in the field of botany, the protection of the environment and nature play a significant role. Furthermore urban ecology, limnology and the study of Mooreland are covered.

As a general rule, our applied research is concerned with documenting the changes in the landscapes and its vegetation and to advise on the optimisation of land utilisation, in a way that includes overall nature protection goals.

The following research projects with a tropical background have been carried out during the years 2004/2005:

- Spread of neophytic trees and shrubs in south-western Germany and in Syria - comparison of the locational conditions of *Quercus pubescens* und *Castanea sativa*. DAAD financed project (Sulaiman Karzon).
- Comparison of Mediterranean ecosystems at the example of transects in the coastal elevations of Lebanon and California. In cooperation with the Fullerton Univ. Calif. and the American Univ. Beirut, DAAD financed project (Joussef Attalah).
- Influence of touristic activities on desert vegetation and their subsequent rehabilitation strategies. Cooperation with the Mu'tah University Jordan, DAAD financing (Oraib Navash).
- The ecological conditions of mangrove-forests in south Bangladesh. Cooperation with the Jahangirnagar University

Savar, Dakha Bangladesh. DAAD financing (Sheikh Harun or Rashid).

- The vegetation of the mediterranean zone in Syria. Cooperation with the Universities of Aleppo and Djidda (Abdullah Ghazal).
- Bio-indication through higher water plants in lake Homs (Syria). Cooperation with the University Damascus; financed by DAAD (Siba Hassan).

Chair: Plant Ecology and Ecotoxicology

Head: Prof. Dr. Andreas Fangmeier

This chair is working on the effects of pollutants from agriculture, industry, traffic and other sources on ecosystems, including all organisational levels from physiology to ecosystem processes. The work contributes to the definition of thresholds to ensure a sustainable development. With regard to the tropics and subtropics, the following activities were performed in 2005:

- Visit of Mrs. Prof. Josanidia Santana Lima von LAVIET - Laboratory of Viable Alternatives for Impacts in Terrestrial Ecosystems, Biology Institute - Federal University of Bahia, Salvador de Bahia, Brazil, as guest scientist from 1 April to 30. Juni 2005. Several projects in the field of environmental monitoring / compost / organic fertilisers were initiated with Prof. Lima which shall be performed in cooperation with other colleagues from Hohenheim. The visit was supported by the DAAD.
- Organisation and performance of the third block seminar of the International Research Training Group (IRTG) „Modeling material flows and production systems for sustainable resource use in intensified crop production in the North China Plain” from 24 to 31 October 2005. The block seminar was entitled „Nitrogen Balance in Cropping Systems – the Contribution of N Volatilization and N Deposition“.
- Successful performance of the first experimental season at the Chinese Re-

search Stations in the framework of the IRTG (coordination: Prof. R. Doluschitz) in the subproject 1.3 „The Contribution of nitrogen deposition to the nitrogen budget“ (subproject leader: Prof. A. Fangmeier).

- Contribution to the application of the third funding period of the SFB564 – „Uplands Program“ – (together with Prof. Thilo Streck) after supervision of a practical of Mrs. Corinna Geiss for six months in Yen Chau, North Viet Nam, on the issue of pesticide use by farmers in paddy rice und fish pond systems.
- An industry funded research project on the effects of fluoride emissions from the chemical industry was continued in its second year in SW Germany. This project has great relevance to (sub-) tropical regions, e.g. Brazil, where comparable projects have been performed in the past (PD Dr. Klumpp).

Institute for Plant Breeding, Seed Science and Population Genetics

Chair: Plant Breeding

Head: Prof. Dr. Albrecht E. Melchinger

The conservation and exploitation of genetic resources are of fundamental importance for a sustainable breeding progress. In a joined project with the International Maize and Wheat Improvement Center (CIMMYT), the genetic diversity present in CIMMYT maize and wheat elite breeding material and genetic resources was determined using molecular markers. This project was financed by BMZ and the Eiselen Foundation. In one study of this project 24 races of maize from Mexico were characterised by SSR markers. The objectives of this study were to (i) determine the molecular genetic diversity within and between the races and (ii) develop methods to systematically exploit the diversity present in the genetic resources but absent in the elite breeding material. In total 497 individual were fingerprinted with 25 SSR markers. We observed a very high genetic diversity (7.84 alleles

per locus), which underlines the broad genetic base of the races of maize from Mexico. Consequently, the races of maize from Mexico show a high potential as source for novel alleles of agronomic interest. We proposed a targeted approach to identify genes and/or alleles within Mexican races of maize that are already lost in the elite breeding material by association mapping.

We initiated in collaboration with ILRI and CIMMYT a new multidimensional approach to develop improved maize cultivars that better match the needs of resource poor mixed-crop livestock farmers. Within this BMZ funded project we will focus on the enhancement of yield and yield stability of maize, that is simultaneously used as feed and fodder in marginal environments in Ethiopia, Kenya and Tanzania. Therefore, an increased tolerance against biotic (gray leaf spot, stem borer) and abiotic (drought, low fertility) stress is of importance. To enhance the selection gain for the traits under consideration we apply the NIRS (near infrared spectroscopy) technology, which should enable us to significantly reduce the time for fodder quality data collection.

Research programmes:

- Unlocking the potential of maize genetic diversity: DNA maps for the use in maize breeding programs and gene banks – CIMMYT, Mexico.
- Efficient management of genetic diversity in wheat: DNA markers for use in wheat breeding programs and gene banks – CIMMYT, Mexico.
- Improving the value of maize as livestock feed to enhance the livelihoods of maize-livestock farmers in East Africa – ILRI, CIMMYT.

Chair: Population Genetics

Head: Prof. Dr. Hartwig H. Geiger

Staff members of the chair for Population Genetics work in close collaboration with national and international agricultural research institutes on applied plant breeding research projects related to the tropics and subtropics.

One major field of research deals with the development and introduction of adapted sorghum varieties with resistance to the parasitic weed *Striga hermonthica* in Kenya, Sudan, Eritrea and Mali. As a result of a habilitation project in collaboration with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) which was completed in 2004, genomic regions (Quantitative Trait Loci, QTL) for mechanical striga resistance were identified in a sorghum genotype from India. In a BMZ funded follow-up project, these striga resistance QTLs are presently being introgressed into two farmer preferred varieties per each of the four participating countries by combining marker-assisted backcrossing and farmer-participatory selection. A critical question with regard to long-term impact is the effect of pollen transfer from neighbouring susceptible sorghum on the expression of the striga resistance QTL. Therefore, pollen dispersal and actual out-crossing rates of the farmer-preferred sorghum varieties are studied in a sub-project by a DAAD-funded Kenyan PhD student who started in summer 2005. Results of this study are expected to allow conclusions about the stability of the resistance transferred, and if necessary, to develop recommendations on variety maintenance. A simultaneous socio-economic study of the sorghum seed supply systems in the four countries is presently conducted in collaboration with the chair for Agricultural Communication and Extension of the University of Hohenheim (Prof. V. Hoffmann) to guide the design of effective seed interventions by partner institutions so that improved materials efficiently reach farmers. In an associated PhD study conducted by a further Kenyan DAAD-funded PhD student in collaboration with the Centre de Coopéra-

tion Internationale en Recherche Agronomique pour le Développement (CIRAD) France, the amount and the effect of gene flow between cultivated and wild sorghum is studied in two regions in Kenya.

A project aiming at the improvement of sorghum productivity by hybrid breeding based on locally adapted germplasm was initiated in 2004 in cooperation with the Agricultural Research Corporation (ARC) in Sudan. In this project, a DAAD-funded PhD student from Sudan investigates the diversity of a representative sample of Sudanese sorghum landraces using microsatellite DNA-markers. Preliminary results indicate a high genetic variability of the tested materials – a prerequisite to group them into heterotic groups. Contrasting landraces were crossed and the crosses were evaluated in the field (Sudan 2005) to determine how closely genetic distance of the parents and hybrid vigour of the crosses are correlated. The data are presently being analysed by the PhD student. The DNA-marker analysis was funded by the Eiselen Foundation Ulm.

An additional DFG-funded PhD project to improve barley productivity in semi-arid to arid regions in the Near East (Syria, Jordan) has been started in 2005. In this project it is planned to increase outcrossing in adapted barley composites via recurrent selection employing molecular markers in order to utilise the positive effect of heterozygosity on yield and yield stability under marginal conditions revealed in earlier studies.

Teaching includes lectures such as "Biodiversität und genetische Ressourcen" and "Nutzung genetischer Ressourcen in der Pflanzenzüchtung" with a strong reference to tropical regions. A recent review article (see list of publications in annex) was based on these lectures. Furthermore, the chair for Population Genetics contributes lectures to the modules "Biodiversity, Plant and Animal Genetic Resources" and "Plant Breeding and Seed Science in the Tropics and Subtropics" of the M.Sc. programme of the University of Hohenheim.

Current research projects:

- Genetic studies of resistance to the parasitic weed striga (*Striga hermonthica*) in sorghum (*Sorghum bicolor*) (Mali, Kenya, India) – Habilitation, completed in July 2004.
- Arresting the scourge of Striga on sorghum in Africa by combining the strengths of marker-assisted backcrossing and farmer-participatory selection (Kenya, Eritrea, Sudan, Mali).
- Marker-assisted heterotic grouping of Sudanese sorghum landraces (Sudan).
- Gene flow from cultivated to wild sorghum (*Sorghum* spp.) populations in Kenya (Kenya).
- Recurrent selection for increased outcrossing rates of barley (*Hordeum vulgare*) from semi-arid regions of Syria and Jordan (Syria, Jordan).

Chair: Plant Breeding and Biotechnology

Head: Prof. Dr. Gerd Weber

Activities in the Tropics and Subtropics of this chair:

Field trip to Costa Rica

From Febr. 28–March 20. 2004 students and professors of the University of Hohenheim participated in a field trip to Costa Rica. This trip was initiated by Profs. Dr. G. Weber (University of Hohenheim), Jorge Herrera and Ramiro Alizaga (Universidad de Costa Rica). The organisation was a joint effort of the Tropenzentrum, the Institute for Plant Breeding, Seed Science and Population Genetics and the University of Costa Rica. A thorough study of tropical agriculture (plants and animals) was made possible by visiting different farm operations (subsistence farming, cooperatives, large scale agro-industries). Furthermore, as part of the activities an intensive exchange of ideas has taken place between students of the University of Hohenheim and the University of Costa Rica.

Profs. Herrera and Alizaga conducted biotechnological research in plants at the

laboratories of Prof. Dr. G. Weber in September and October 2004.

Dr. Axel Schwekendiek was awarded a guest professorship by DAAD in August and September 2005 at the University of Costa Rica. During his tenure he taught 2 courses on Plant Biotechnology and Plant Biochemistry, respectively.

Prof. Dr. Gerd Weber was invited to participate in a DAAD sponsored workshop at the University of Costa Rica on “Searching for new funding in Germany for academic applications” in Nov. 2005.

Institute for Biological Chemistry and Nutrition

Chair: Biological Chemistry and Nutrition

Head: Prof. Dr. Hans Konrad Biesalski

In the years 2004/2005 following research activities in the fields of nutrition assessments, micronutrient supplementation, reproductive health, breastfeeding and complementary feeding issues have been planned and implemented in different developing countries.

In Ethiopia, in close collaboration with the Ethiopian Health and Nutrition Research Institute (EHNRI) a PhD proposal for a “Clinical trial to assess the effect of topical vitamin A application on cervicovaginal HIV shedding in HIV-positive pregnant women: a randomized placebo-controlled micronutrient intervention trial to reduce the risk of mother-to-child transmission in Addis Ababa, Ethiopia” has been developed and meanwhile it passed two Ethical clearance committees. Recently, funding for the pilot phase of this research project has been secured.

In addition, a study proposal on “Micronutrient supplementation via topical application of a skin protection oil on the breast of lactating mothers” is currently investigated and developed together with an EHNRI PhD candidate.

The results of a study on “Prevalence of breastfeeding in Tigray and Gonder, Ethiopia, with special reference to exclusive/predominant breastfeeding beyond six months” indicate that up to eight months there seems to be no major difference in the nutritional and health status of exclusively breastfed versus mixed fed infants (Breast-feeding Review 12(3): 9-16).

Also in close cooperation with EHNRI and the Norwegian Lutheran Mission a Diploma thesis with the title “Comparative study of mothers nursing an infant below one year of age in the Highlands and the Lowlands of Bale, Ethiopia: Food intake and feeding practices, post-partum amenorrhea, contraceptive use, child spacing and nutritional status” was developed in 2004 and implemented and completed in 2005. Currently, there is a plan to publish the most interesting findings of this study in 2006.

In Uganda, in close collaboration with Kumi Hospital and the German Missionary Medical Team (GMMT) a Diploma thesis with the intent of “Improving the management of malnourished children in Kumi – Nutrition Rehabilitation Centre, Uganda: Milk based diet versus Ready-to-use therapeutic food (RUTF)” was developed and implemented in 2005.

In Thailand, a prospective study in collaboration with the Shoklo Malaria Research Unit (SMRU) in Mae Sot and the Research Institute for Health Sciences (RIHES) in Chiang Mai, Thailand has been started in 2004: “Impact of micronutrient enriched flour on the nutritional status of pregnant and breast-feeding women with respect to DDT exposure in Maela refugee camp, northern Thailand”. The impact by supplementation of micronutrients and exposure to DDT (used as an insecticide to control malaria) on pregnancy outcome and infant development will be assessed (PhD thesis). Respective laboratory analysis of a cross-sectional study (> 500 pregnancies) on micronutrients and DDT will be done until mid of 2006. A pre-study in pregnant women of Maela camp showed high amounts of DDT residues affecting plasma vitamin A (Stuetz *et al*, Sci Total Environ 2005).

In Indonesia, in close collaboration with the SEAMEO-TROPMED-Regional Centre for Community Nutrition, University of Indonesia a PhD project on the effects of periodic vitamin A capsule supplementation programmes has been implemented. In 2004, part of the results have been published in a second paper called “Socioeconomic and familial characteristics influence caretakers adherence toward periodic vitamin A capsule supplementation programme in Central Java, Indonesia (J Trop Pediatr. 50(3): 143-148).

In 2005, a PhD research proposal on “Product development and field trial of two different types of ready-to-use therapeutic food (RUTF) during the rehabilitation phase of malnourished children in West Timor” has been developed. The implementation of the project will start in 2006.

Lectures on “Nutrition in Developing Countries” take place as part of a lecture series called “Special risk groups in Nutrition”. Currently, there is a focus on the following topics:

- Introduction and overview to International Nutrition;
- Measurement approaches of nutritional status;
- Micronutrient deficiencies;
- Protein-Energy Malnutrition (PEM) with special focus on therapeutic feeding;
- Nutrition in emergency situations including general food ration and supplementary feeding programmes;
- Breastfeeding in emergency situations with special focus on HIV/Aids.

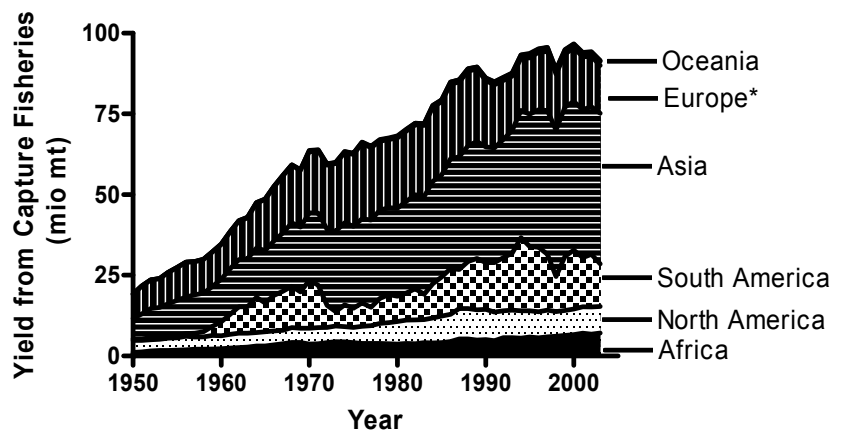
In 2005, our institute offered for the first time a Master Module “International Nutrition” which is placed within the EnviroFood Master Programme.

5.3 Thematic group II Animal Production

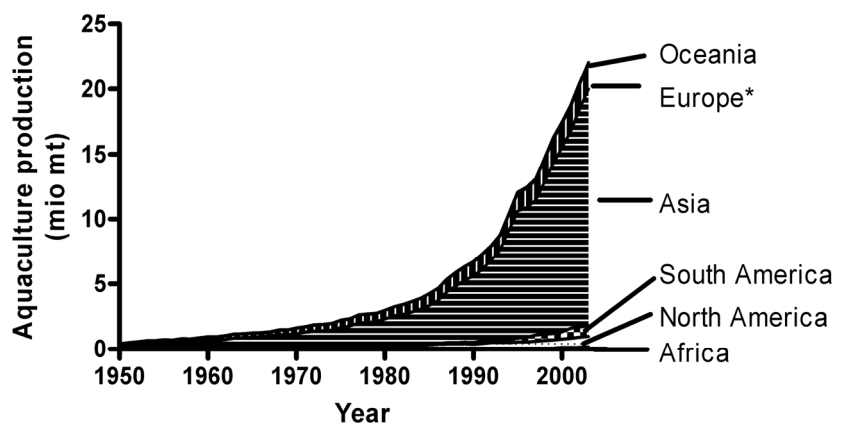
Special: Aquaculture

Fish is an exceptional food source. Not only in the Bible but also in many other religions fish is associated with myths and social customs and has a rather miraculous effect together with bread or rice. We cannot scientifically explain the miracle of the feeding of the ten thousand, but the high appraisal of fish in many cultures is probably based upon its high content of essential amino acids and fatty acids, making fish an ideal supplement to plant-dominated diets.

After a considerable increase in production of capture fisheries from the 50's to the 70's the yield has stagnated for the past 20 years and supply cannot keep pace with the present day population growth. Furthermore, it has to be taken into account that a major part of the fish-catch (up to 36%) does not directly contribute to the human food supply but rather only after it has been processed into fish meal for the use as animal feed, albeit with enormous processing losses. In the past years, the estimated sustainable fish yields from the world's oceans had to be corrected repeatedly to lower values. It is quite possible that the sustainable, long term realistic fish yield for the fish stocks that can currently be harvested in an economic way has already been reached or even surpassed.



Worldwide yield from capture fisheries (1950-2003)



Worldwide aquaculture production (1950- 2003)

*Europe including former USSR

Due to the decreasing per-capita supply of products stemming from the fishing industries, large expectations have been placed on aquaculture, since the end of the 70's to make up for this deficiency and thus contribute to the global protein supply. In the last couple of decades, aquaculture has increased dramatically with an average growth rate of more than 10% and is, according to the FAO, the fastest growing sector in animal production. But, the direct consequences of this increase in production should not be overestimated.

The traditional aquaculture systems in South East Asia use fish species that feed at a low trophic level. This means, that their natural basic feed source consists of algae and micro-organisms. These feed resources can be improved cost-effectively in semi-intensive aquaculture

systems by adding fertiliser and lime to the ponds as well as by feeding agricultural by-products such as rice-husks. The traditional fish species for these systems are milkfish on the South East Asian islands and numerous carp-like fish on the mainland. These fish contribute to the subsistence of the farmer and are also delivered to the local and domestic markets. In the past 30 years various species of tilapia have been spread-out on a global scale and have been introduced into such semi-intensive systems as well.

The immense increase in aquaculture production in South East Asia since the end of the 70's is essentially a result of the introduction of aquaculture systems for shrimps and precious species of finfish. This success ensued predominantly from intensive aquaculture systems, where the growth of the fish is based exclusively on the supply of external, top quality feeds, similar to the trout production in Central Europe. The feedstuff consists mainly of fishmeal, which means that an increase in aquaculture production is also accompanied by an increase in the consumption of fishmeal. The typical feed consumption per fish amounts to 1.5 to 3 kg (dry weight) per kg of fish. In general, this fish production almost exclusively supplies the urban and international markets.

The export oriented aquaculture systems can be a substantial source of employment and income in rural areas, but on the other hand they can also be the source of severe environmental damage and can lead to unsustainable land use.



Marketing of milkfish in the Philippines

In some regions, for example in the Philippines, aquaculture systems providing for the domestic market (in this case the milkfish production) compete with others that supply the international markets (for example shrimp production) for limited resources such as brackish water ponds. As a result, the expansion of the shrimp production in the Philippines in the 90's has led to a reduction in the domestic fish consumption.

For a long time, the research activities of the aquaculture systems group at the University of Hohenheim in the Philippines were focused on improving the feeding of milkfish in order to increase the productivity and therefore the competitiveness of the milkfish production compared to the shrimp production and consequently to secure the production for the domestic market. In the framework of the SFB564, aquaculture systems of resource-poor farmers in North Viet Nam are investigated. These farmers of the ethnic minority "Black Thai" have practically only grass and leaves available as fish feed. Other research objectives of the aquaculture systems group focus for example on the substitution of fishmeal through vegetable protein in intensive aquaculture systems and on comparing the production requirements and the impact on the environment of intensive, semi-intensive and biological shrimp production in Brazil.

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The thematic group II „Animal production“ consists of 23 persons (Annex 2).

Institute for Animal Production in the Tropics and Subtropics

Chair: Animal Breeding and Husbandry

Head: Prof. Dr. Anne. Valle Zárate
Prof. em. Dr. Christian F. Gall

Analysis of animal husbandry systems and development of sustainable breeding programmes for marginal locations are a main focus of our research. In our regard, a holistic approach on animal husbandry systems as an integral part of culture and economic operations of livestock keepers is the basis for optimisation of production techniques and stabilisation of systems. Modelling approaches are used for identification of intervention points and response-forecast of technical measures. Starting points are the investigation of productive adaptation potential of local breeds and an analysis of use-efficiency of available resources under (semi-)nomadic and smallholder conditions. The development and promotion of village breeding programmes aim at the conservation and use of genetic variety through breeding and organisational measures, in cases where this is economic sound and socio-cultural intended. Participation of livestock keepers and cooperation with governmental (GO) and non-governmental-organisations (NGO) is an integral part in development and organisation of our research projects abroad. Different modelling and planning programmes are used and further developed for the optimisation of breeding measures and for planning of breeding. Also in marginal locations in the tropics, the combination of animal identification, herd- and data-management are prerequisites for breeding and quality assurance and therefore integral methodological part of different research projects.

Our research programme has regional focal points in South America, East Africa and

South-East Asia and the Middle East. It comprises as well research projects related to research questions relevant for extensive husbandry systems, organic livestock, and technical methods to improve livestock's adaptability to warm climates. The following research projects were dealt with during the reporting period:

A. Animal production systems

- Quantitative baseline information on livestock production systems for various geo-economic regions in a production-systems/agro-ecological framework; co-operation project with FAO, Rome.
- Analysis of animal production system in H'mong Villages of Son La province (Vietnam); SFB564, The Uplands Programme; cooperation with NIAH, Hanoi.
- Efficiency of smallholder animal husbandry depending on management intensity and genetic potential of livestock in mountainous regions of North Viet Nam; SFB564, The Uplands Program; several cooperation projects with NIAH, Hanoi.
- Analysis of village milk production in the Punjab of Pakistan and identification of effective development strategies; in connection with a GTZ project.
- Evaluation of production systems of llama husbandry in the high Andes of Bolivia; cooperation with Universidad Mayor de San Simón, Cochabamba, NGO ASAR.
- Evaluation of camel health management practises of pastoralists in Kenya; cooperation with KARI.
- Development of a textbook on nomadic livestock keeping for secondary schools in northern Kenya; cooperation-project with pastoralists and scientists (animal science; education science); cooperation with KARI.
- Bio-economic optimisation of small ruminant husbandry in two production systems in the highlands of Ethiopia; cooperation with Debub University, Awassa.
- Use of multi purpose goats (milk, meat, fibre) in different husbandry systems.
- Integrated management of kids and lac-

tating goats using an automatic feeding system; cooperation project with Förster-Technik, Engen.

B. Characterisation of animal genetic resources

- World-wide gene flow of animal genetic resources: actual status, effects, trends with case studies on cattle (Boran, Tuli), sheep (Awassi, Assaf), goats (Anglo Nubian) and pigs (local Vietnamese breeds); commissioned by BMZ, GTZ.
- Identification of selection criteria for local pig breeds in North Viet Nam: comparison of genetic and economic parameters preferred by animal keepers and derived from this findings logistic regression coefficients; cooperation with NIAH, Hanoi, and ILRI, Addis Abeba.
- Phenotypic and biometric characterisation of autochthonous Vietnamese Ban-pigs; cooperation with NIAH, Hanoi.
- Determination of assessment criteria for animal genetic resources of traditional livestock keeper communities and application to camel breeding taking as example nomadic people in northern Kenya; cooperation with KARI, NGO PEAR group, Nairobi.
- Development of body weight and body condition of Rendille Camel types in northern Kenya; cooperation with commercial ranch.
- Improving the livelihoods of poor livestock keepers in Africa through community-based management of indigenous farm animal genetic resources; co-operation with ILRI, INRAB (Benin), Institut de l'Environnement et de Recherches Agricoles (Burkina), Association Gestion de l'Environnement & Développement, (Burkina), Oromiya Agricultural Research Institute (Ethiopia), Liban Woreda Agricultural Development Office (Ethiopia), Dept. of Agricultural Economics, University of Nairobi (Kenya), KARI (Kenya), Institute for Animal Breeding, University of Göttingen (Germany), NGO League for Pastoral Peoples/LIFE, GTZ.
- Characterisation of local animal genetic resources in a system context: small ru-

minants in nomadic production systems in northern Kenya; cooperation with KARI, Nairobi, ILRI, Addis Abeba, and GTZ/GEF Indigenous Vegetation Project, Marsabit.

- Genetic improvement of chicken breeding lines with specific adaptation to tropical locations by utilisation of major genes (F, Na, dw, Fm, id, sc).
- Impact of major-genes for feather reduction on performance and survivability of broilers in hot climates; cooperation with HUJ, Rehovot.
- Identification and analysis of special dairy traits in goats regarding milk ingredients and milk processing.

C. Development of breeding strategies and rural breeding programmes

- Development of village breeding programmes incorporating genotypes with productive adaptation potential; SFB564, The Uplands Program; cooperation projects with NIAH, Hanoi.
- Population genetic analysis and implementation of performance testing and selection in Llama populations of the High Andes of Bolivia; cooperation with Universidad Mayor de San Simón, Cochabamba, Division Livestock Sciences, University of Natural Resources and Applied Live Sciences Vienna (BOKU), Vienna.
- Development of a selection programme, identification of adequate methods to calculate economic weights and optimisation of breeding programmes for a llama population in the region Ayopaya, Department Cochabamba (Bolivia); cooperation with Universidad Mayor de San Simón, NGO ASAR, Cochabamba.
- Development of a breeding organisation and marketing cooperatives with llama breeders in the high Andes through utilisation and further development of llama populations with special fibre qualities; cooperation with Universidad Mayor de San Simón, NGO ASAR, Cochabamba.
- Improving lamb meat and milk production of fat-tailed sheep of the Middle East through breeding; co-operation project with Volcani Center, Bet Dagan (Israel),

NGO Agricultural Engineers Home Society (Palestinian Authority), National Center for Agricultural Research & Technology Transfer (Jordan).

- Optimisation of management and breeding of triple-purpose goats (milk, meat and fibre) in Bolivia; cooperation with Universidad Mayor de San Simón, Cochabamba.

Chair: Aquaculture Systems and Animal Nutrition

Head: Prof. Dr. Klaus Becker

The work of the chair aims for a sensible and effective utilisation of natural resources and agronomical side products through terrestrial and aquatic farm animals in terms of sustainable income and food production for predominantly small farm holders.

Emphasis is given to analyses of tropical feed stuffs, especially regarding secondary plant compounds (tannin, saponin etc.) and their effect on various types of animals. Further work aims for the quantification of microbial activities in the rumen depending on the feed, analyses of feed intake and nutrient transfer of grazing animals in semi-arid areas as well as examinations of nutrient flow in tropical aquaculture systems and the interaction between aquaculture, environment and catch fishery.

The following projects were conducted during the report time:

- The influence of livestock management on nutrient recycling in sedentary agropastoral farming systems of the Sahelian zone. Germany, Niger.
- Utilization of *Moringa oleifera* leaves and meal as fish feed resource. Germany.
- Studies on the utilisation of *Jatropha curcas* seed cake as animal feed. Germany, India.
- Studies on propagation of non-toxic variety of *Jatropha curcas*. Germany, India.
- Biofuels from eroded soils. India.
- Studies on the cultivation and utilisation of *Jatropha curcas* in Madagascar.
- Population structure and physiological

activity of rumen micro-organisms and their response to antinutritive secondary plant compounds (tannins, saponins). Germany, Gambia.

- New plants and plant extracts to decrease methane and nitrogenous emissions from ruminants and to alleviate nutritional stress (RUMEN-UP). Germany, UK, Ireland, Switzerland, Spain.
- Plants and their extracts and other natural alternatives to antimicrobials in feeds (REPLACE). Germany, UK, Ireland, Switzerland, Spain, Denmark, Norway, Poland, Slovakia.
- Ruminal defaunation with *Sapindus rarak* to improve ruminant production. Germany, Indonesia.
- Productivity, rumen physiology and microbial community composition in N'Dama cattle and their crosses fed conventional diets and alternative supplements (*Moringa oleifera* leaves). Gambia, Germany.
- Characterisation of nutrient content and anti-nutritional factors in currently non-utilised legumes. Germany, India.
- Isolation and assessment of beneficial effects of legume saponins. Germany, Israel.
- Investigating the aquatic nutrient cycle and the food conversion efficiencies of natural and supplemental food sources by cultured fish in Laguna de Bay. Philippines.
- The influence of aquaculture on the feeding ecology of fish in Laguna de Bay. Philippines.
- Investigations on the influence of Nitrogen/Phosphorus ratio in Laguna de Bay, Philippines on the growth and chemical composition of algae and their utilizability for fish. Philippines.
- Utilisation of natural food and supplemental feed in semi-intensive culture of milkfish in the Philippines: A survey in commercial fish farms on the island of Panay. Philippines.
- Effect of feed properties on food selection, food intake and growth of penaeid shrimps. Germany.

- Development of improved techniques for the tracing of aquatic food chains by stable carbon isotopes. Germany.
- Investigations in the effect of ration size and composition on stable carbon isotope ratios and enzyme activities in fish. Germany.
- Investigations in the effect of different mixtures of C3- and C4-plant derived components in the diet on the stable isotope composition in body tissues of fish and arthropods. Germany.
- Investigations on the effects of feed supplementation with saponins on growth, metabolism and sex ratio of fish. Germany, India, Bangladesh.
- Development of alternative live food for larval fish and shrimp rearing. Germany, Italy, Philippines, Malaysia, Mexico.
- Development of verified stomach content models for the quantification of daily ration in fish. Germany.
- Effect of stocking fish in rice fields on nutrient turnover and methane emission. Germany, Bangladesh.
- Nutrient flow in resource-limited aquaculture systems in Son La province, Viet Nam.
- Increasing the productivity and efficiency of Nile tilapia production using plant saponins. Germany, Palestine, Israel.

Apicultural State Institute

Head: Dr. Peter Rosenkranz

The following research activities related to the tropics were continued or initiated:

- During the period 2000 to 2004 around 800 freshly harvested honey samples were collected from various regions in Uganda, these samples were examined for their chemical, physical as well as their pollen (analytical) properties. In cooperation with the UNIDO (United Nations Industrial Development Organisation), the Government of Uganda, the Makerere University in Kampala and the Uganda Honey Beekeepers Association, a proposal for the creation of a federal state

standard for honey was drawn up. At the beginning of 2005 the Ugandan Honey Standard was officially approved by the government and an application at the EU for the authorisation to export honey was submitted, which in the meantime has been granted. (Dr. Horn).

- During a 2-week visit in Sanáa, Yemen in January 2005, a honey laboratory was set up on behalf of the GTZ. Eight colleagues from the Institute for Food Protection were given an assignment to analyse honey. The knowledge gained is intended to be used for fundamental research in order to create a database, which will be used to formulate a national honey standard. Parallel to this, samples were collected for our own database. (Dr. Horn).
- Mr. Yehga Attal has completed his DAAD funded doctoral thesis on "Parasitic host relationships between the *Varroa destructor* mite and various honeybee species (*A.m. syriaca* and *A.m. carnica*) in different climatic regions in Jordan". (Dr. Rosenkranz).
- The joint project sponsored by BMELV/BLE (Bundesministeriums für Ernährung, Landwirtschaft und Verbraucherschutz / Bundesanstalt für Landwirtschaft und Ernährung) dealing with the biology and control of the small hive beetle (*Aethina tumida*, a cleptoparasite affecting bee colonies) has been initiated. Sandra Mustafa visited the Rhode-University in Grahamstown (South Africa) for several months to investigate under natural conditions e.g. the chemotactic behaviour of this beetle (Dr. Rosenkranz).
- Dr. Rosenkranz has been invited to Uruguay and Brazil to give lectures. On this occasion a cooperation was established with colleagues from USP in Ribeirao Preto (SP, Brazil) to establish a bee centre including a honey laboratory in Rio Grande do Norte. In addition molecular genetic experiments were conducted within the framework of a long-term project on *Varroa* tolerance on the Fernando de Noronha Island. (Master thesis Dainat).

5.4 Thematic group III Agricultural Economy and Sociology

Special:

Economic valuation of environmental improvement projects in the Philippines

In 2004 the chair for economics, especially environmental economics and public policy participated in the "International Seminar and Workshop on Tropical Ecology" for the first time. This workshop took place for the 10th time and was hosted by the Leyte State University (LSU) in the vicinity of the town of Baybay on the island of Leyte, Philippines. In the course of 14 days students of the universities of Hohenheim, Halle and the LSU could acquire theoretical and practical knowledge of special aspects of tropical ecology. In addition to the seminal lectures of professors from Germany, Austria and the Philippines the programme consisted of excursions, practical field work in groups and presentations of the results.

The activities of the socio-economic working group are centered on the application of methods of environmental economic valuation. Following the anthropocentric view of the world in economics the main objective of these methods is the assessment of the changes in social welfare brought about by changes of the natural environment, i. e. the assessment of the change of well-being of the population. It is common to measure these welfare changes in monetary units since money as a universal means of payment for market-traded commodities converts any change in utility or welfare into its monetary equivalent.

For instance, if I am willing to pay 10 Euros for a roller coaster ride one can infer that the utility gain experienced by such a roller coaster ride is at least as great as the utility gain from the consumption of market commodities of the same monetary value. The commonly used Contingent Valuation Method for the assessment of the value of environmental



Household interviews in Baybay



Young rainforestation farming plot

goods is based on surveying a representative sample of the population affected by some environmental improvement project with the aim to assess their willingness to pay for this project. In order to compute the change in social welfare the mean willingness to pay estimated from the sample is aggregated to the whole population affected by the project. Two projects that are currently being implemented by the LSU were chosen as practical examples for the workshop. The first project deals with the transformation of degraded agricultural land in the mountainous regions surrounding the provincial town of Baybay to a sustainably managed agroforestry

system called rainforestation farming. Reforestation of these areas is done exclusively with native tree species; adapted crops that can be sold on local markets are planted in the understorey. This system provides the farmer with multiple sources of income while the sustainability of the system is ensured. For the inhabitants of Baybay this system with its enhanced water storage capabilities leads to a reduction of destructive flooding events and landslides that have resulted in considerable damage in the recent past. The second project deals with the preservation of marine resources in coral reefs of islands just off the coast of Leyte. Dynamite fishing has led to immense damage especially to the habitats of young fish populations. In order to rehabilitate these habitats marine sanctuaries monitored by the LSU were established from which the population of the islands will benefit by larger fish populations in the future.



Fishing boats near Apid Island

In two valuation studies the mean willingness of the population of Baybay to finance an extension of the rainforestation farming areas on the one hand, and the population of an offshore island to finance the maintenance of the marine sanctuary on the other, was determined. In Baybay a total of 45 households were surveyed, on the island 41 households were questioned in personal interviews by teams of the socio-economic working group. It turned out that both survey populations placed a considerable value on their respective projects: for the population of

Baybay an aggregated willingness to pay for the rainforestation farming of about 5 million Philippine Pesos (ca. 76 000 Euros) was estimated, whereas the maintenance of the marine sanctuaries was valued by the affected population at about 290 000 Pesos (ca. 4 500 Euros). Thus, the studies conducted by the socio-economic working group were able to demonstrate that the projects carried out by the LSU under considerable effort, are not only of ecological value but that they additionally constitute a quite tangible utility gain for the population living in these areas.

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Further tropical oriented projects of this chair :

SFB564 subproject F1.2 Tenure and Economic Valuation of common-pool resources in mountainous regions of Thailand and Viet Nam (second phase)

SFB564 subproject F1.3 Economic valuation of environmental improvements in northern Thailand and northern Viet Nam (third phase)

Thematic group III "Agricultural Economy and Sociology" consists of 24 persons (Annex 2).

Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics

Chair: Rural Development Economics and Policy

Head: Prof. Dr. Dr. h.c. Franz Heidhues (till November 2005)

Prof. Dr. Manfred Zeller (since November 2005)

The main research areas of this chair cover economic policies and institutional frameworks of the development process, with particular emphasis on rural areas. Research projects are focused on the impact of international policies and domestic development policies on food security, on reducing poverty and on the production and incomes in rural areas. A second main research area concentrates on innovations with a particular emphasis on participatory research to promote the shaping of innovations suited to address farmers problems.

In the field of rural financial markets, research is directed at sustainability of rural financial institutions in the long-term, to access for all groups, especially the poor and women, to rural financial markets for their diverse demand for credit, savings and insurance services, and to efficiency and transaction costs of rural financial institutions. Besides publicly sponsored initiatives to develop rural financial institutions, also the cooperative savings and credit banks as well as village banking systems are investigated in developing countries.

To combine food security with a sustained use of natural resources requires to promote an innovation friendly institutional environment; secure property use rights of natural resources and involving farmers in the research process are important ingredient. Both are important research topics of this chair.

During the period under report, 16 diploma and master theses were supervised and 6 doctoral theses completed. Especially gratifying was the fact that two students received in 2005 awards for outstanding work in their Master Thesis. Mr. Nazaire Houssou received the Hans-H. Ruthenberg Graduate Award and Mrs. Martha Oumer received the DAAD award for overseas students.

Special Research Program SFB564 (The Uplands Program).

Prof. Heidhues acts as speaker for the SFB564 project "Sustainable Land Use and Rural Development in Mountainous Regions of Southeast Asia". He coordinated the work together with the management unit, Dr. Pape in Hohenheim and the coordinators Dr. Andreas Neef (Thailand) and Dr. Harold Leisch (Viet Nam). A major effort was directed at conceptualising and organising the preparation for the 3rd phase of the SFB564. During the second phase (2003-2006), the chair participates in the SFB564 with the following sub-projects.

Project area A: Participatory research approaches in an intercultural context

Sub project A 1.2: Potential and constraints of participatory approaches and interdisciplinarity. Prof. Dr. Dieter Neubert, Dr. Andreas Neef and M.Sc. Rupert Friedrichsen.

Project area F: Rural institutions and policy measures

Sub project F1.2: Tenure and economic valuation of common-pool resources in mountainous regions of Thailand and Viet Nam. Prof. Dr. Franz Heidhues, Prof. Dr. Michael Ahlheim, Dr. Andreas Neef and Dipl. Geoökol. Oliver Frör.

Sub project F2: Rural finance and sustainable rural development in northern Viet Nam. Prof. Dr. Gertrud Buchenrieder, Prof. Dr. Franz Heidhues and Dipl. Ing. Thomas Dufhues.

Chair: International Agricultural Trade and Food Security

Head: Prof. Dr. Matin Qaim

With the appointment of Professor Qaim as successor of Professor Von Oppen in April 2004, the previous name of the chair „Agricultural Markets in the Tropics and Subtropics“ was changed to „International Agricultural Trade and Food Security“. This also reflected a slight change in research and teaching directions. Although research on agricultural markets in developing countries is continuing, the focus is now primarily on high-value markets, which are growing in importance internationally, with new challenges for smallholder farmers. Planned and ongoing projects put a special emphasis on the economics of food quality and safety and related institutional challenges for domestic and export supply chains. Beyond these market and trade aspects, a second research focus is on the socioeconomic causes and consequences of malnutrition in developing countries. Ongoing efforts concentrate especially on micronutrient deficiencies and strategies to overcome them. Finally, a third focus is on the implications of new agricultural technologies in the small farm sector with a special emphasis on biotechnology and genetically modified crops.

Research projects in the reporting period 2004/2005:

- Agricultural markets and rural development in Thailand and Viet Nam.
- Increasing demand for food quality and safety and supply chain responses in Viet Nam.
- The role of off-farm income for food security and agricultural productivity in Nigeria.
- Economics of micronutrient malnutrition (Philippines, India, East Africa).
- Economic analysis of the nutrition and public health impacts of bio-fortified staple food crops (India, Uganda).
- Economic analysis of Golden Rice (India, Philippines).
- Adoption and impacts of genetically modified

crops (Argentina, India).

- Implications of participatory technology development (Benin, Nigeria).

Chair: Farming and Rural Systems in the Tropics and Subtropics

Head: Prof. Dr. Werner Doppler

The objectives of the Chair in academic training are to familiarise students with the problems of development at farm, household, family, communal and project level and especially to enable students to apply the methodologies in farm management, home economics, project management and rural livelihood development. The rationale of the lecturing content is based on quantitative methods in a systems approach which includes economic as well as social elements and centres on living standard of families and livelihood of the rural societies. The lecturing activities are in the master programmes „Tropical Agriculture“, „Environmental Protection and Agricultural Food Production“ and in „Agricultural Economics“.

The objectives in research are the development and assessment of methodologies as well as at empirical analyses for problem-solving strategies in the following sectors:

Methodology:

- Integrating farm management methods into a holistic concept which focuses on family decision-making by incorporating farm, household, off-farm activities as well as gender and socio-cultural related influences on decision-making. This will contribute to the definition and concepts of living standard of families and rural livelihood.
- Incorporation of space and extending the methodologies in agricultural economics combined with remote sensing and Geographical Information Systems. This will contribute to a wider base in knowledge and information systems and to spatial modelling.
- Developing mathematical simulation models which combine the economic and social objectives of a decision-making

process with the dynamics of development in social groups and spatial differentiation to assess the impact of future problem solving strategies at family and rural societies' level.

The empirical areas can be summarised as follows:

- Analyses of family living standard and rural livelihood;
- Decision-making and the role of gender;
- Overuse of land resources and the economics of conservation and rehabilitation strategies;
- Economics of organic farming and renewable energy concepts;
- Water resources and water pricing policies, re-use of water and irrigation economics;
- The role of ethnic differentiation in rural development (e.g. Bedouins in the Middle East, hill tribes in Southeast Asia, indigenous groups in Amazon area);
- The role of social networks and institutions on living standard and livelihood.

The regional focus in research is the Middle East, Southeast Asia, Central America and Amazon region, and West and East Africa with the following main research projects are as follows:

1. Water resources development, re-use of water and irrigation economics in the Middle East. Covering the countries Syria, Jordan, Palestinian Authority area (West bank and Gaza) and Israel. The programme is funded by different sources such as the Syrian Government, DAAD and the German Ministry of Economic Cooperation (Global Water Jordan River, GLOWA). Cooperation with the University of Aleppo, Syria; Technical University of Haifa, Israel; Jordan University in Amman, Jordan; Al-Azhar University in Gaza, Palestinian Authority and the Arab Agronomist Association/Palestinian Agricultural Relief Committee (PARC), Westbank, Palestinian Authority.
2. Resource management in mountain farming and rural livelihood in Southeast Asia. The programme started in 1989 and

several publications are available. Covering the countries Viet Nam, Thailand, Laos and Indonesia. Currently a sub-programme started on "Impact of water resources development and irrigation on rural livelihood - cases from Thailand" funded by Dr. Eiselen, Ulm and supported through PhD scholarships from DAAD. Cooperation with Asian Institute of Technology (AIT) Bangkok, Universities of Chiang Mai, Kasetsart in Thailand, Thai Nguyen University in Viet Nam.

3. Socio-economic development in forest margins of the Amazon rainforest. Covering the countries Brazil, Guyana and Venezuela. A second programme deals with the impact of cross countries market relation on the development of different farming systems in Nicaragua, Honduras and El Salvador. Cooperation with Lutheran University Centre of Palmas (CEULP/ULBRA) Brazil; Faculdade Boa Viagem (FBV) Recife, Pernambuco, Brazil; University of Guyana and International Center of Tropical Agriculture (CIAT) Cali, Colombia.
4. The research projects in West and East Africa deal with food security and gender role as well as resource management and soil conservation economics. Cooperation with the University of Cotonou, Benin; University of Nairobi, Kenya; Makerere University, Kampala, Uganda and IITA (International Institute of Tropical Agriculture) Nigeria.

Josef G. Knoll Visiting Professorship for Development Research

Head: PD Dr. H. Rüdiger Korff (till Sept. 2004)
Dr. Thomas Berger (since Dec. 2004)

Dr. Dr. h.c. Herrmann Eiselen, Honorary Senator of the University, has self-financed the Josef G. Knoll chair at Hohenheim University for research in the developing countries since 1996. The chair holder is responsible for research and teaching in the field of "The Developing Countries" and is aimed at applying scientific methods to achieve sustained food security, to protect the natural resources and to fight against poverty. The

process of introducing and adopting innovations therefore requires special consideration.

As regards the organisation, the chair is assigned to the Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics (490). At the end of 2006 the financial support from the sponsor will expire, nevertheless this chair will be continued within the framework of the federal state budget.

Until 30th September 2004, PD Dr. Heinz-Rüdiger Korff was the holder of the chair. Dr. Berger, who came in December 2004, is the forth holder of this chair. Dr. Berger is focusing on human-environment interactions in land use, water resources management and renewable energies, especially in developing countries. Bio-physical and socio-economic processes are analysed in an integrated manner to better assess the impacts of policy changes on natural resource conditions and food security.

Integral part of research and teaching are methods from the computer sciences such as multi-agent systems that help to model environmental impacts and adjustment processes at actor level and reveal the distributional effects of policy interventions on different population groups. The micro-economic foundation together with spatial and social network analysis is a central feature of our research.

Current projects:

- Integrating Governance & Modeling – project within the CGIAR Challenge Programme on Water and Food. Research issues: Sustainable use of land and water resources, collective action; multi-stakeholder governance structures; planning/decision support based on multi-agent systems. Countries: Chile and Ghana.
- Agent-Based Simulation of Sustainable Resource Use in Agriculture and Forestry – Junior Research Group of Robert Bosch Foundation. Research issues: Land-use modeling with multi-agent systems. Countries: Chile, Ghana, Uganda und Thailand.

Institute for Farm Management

Chair: Analysis, Planning and Organisation of Agricultural Production

Head: Prof. Dr. Drs. h.c. Jürgen Zeddies

Research in the field of company organisation and leadership, is at the centre of attention regarding the analysis of smallholdings and sectors in agricultural and food economy. Also of special significance is the commitment to a sustained agricultural production system, as well as international competitiveness. A sustained and in particular suitable location for agriculture on the basis of a continuous shortage of natural resources is an important research issue. Due to the increasing globalisation and internationalisation of the market, as well as the issues arising from the worldwide competitiveness of various locations, additional fields of research will be opened.

In the period 2004/2005 the following tropics-related research projects were underway:

- Bio-ethanol production in Thailand and Australia: An investigation into the respective costs of productions, the political environment as well as the potential analysis in view of international competitiveness and the contribution to climate-protection by using organic fuels from various raw materials.
- Bio-ethanol production in Brazil: A presentation of the research results in the diploma thesis “Economisation and potential of bio-ethanol production in Brazil” by Jens Frey.

Chair: Computer Applications and Business Management in Agriculture

Head: Prof. Dr. Reiner Doluschitz

The main research areas of this chair are (I) the conception and development of adapted management forms for agricultural enterprises of different types of production plan and sizes, (II) the conception and development of strategies for the environmental management at enterprise level in

enterprises of the agrarian and food production, (III) the GIS supported environmental management and methodical advancement of appropriate models to inter- and transdisciplinary environmental information systems on regional, national and international level as well as (IV) the technological impact assessment of electronic forms of transaction (e-Commerce/e-Business) in the range of the agrarian and food production.

The following tropical based research projects were worked on in the reporting period:

- Modelling material flows and production systems for sustainable resource use in intensified crop production in the North China Plain: Development and implementation of an integrated agro-environmental information system at regional levels of different scales in the North China Plain.
- Sustainable land use and rural development in mountainous regions of southeast Asia: Assessment of innovations and sustainability strategies at farm household and regional level in northern Thailand and Viet Nam.

Institute for Economics

Chair: Economics, esp. Environmental Economics and Public Policy

Head: Prof. Dr. Michael Ahlheim

The chair's research related to the tropics and subtropics focuses on the field of economic valuation of environmental goods and their changes using monetary valuation methods. Following the anthropocentric view of economics we investigate the question to what extent changes of the natural environment result in changes of social welfare, i.e. effects on the well-being of the population affected by environmental changes, where these welfare changes are measured in monetary units. In practice, there are three main fields of application of economic environmental valuation: the evaluation of publicly funded environmental projects using cost-benefit analysis, the assessment of environmental damages resulting from environmental accidents and the extension of the

official statistics by taking changes in the stock of natural capital into account.

This chair is engaged in theoretical analysis and further development of the methods of environmental valuation on the one hand and in their practical application on the other, especially, among other regions, in the tropics. In addition to the traditional valuation methods based on individual interviews like e.g. the Contingent Valuation Method group based, participatory valuation techniques like the Market Stall Method or Citizen Juries are integrated into these environmental valuation studies. Besides the various theoretical papers that were produced in the department, empirical research projects dealing with special aspects of reliability and validity of the approaches mentioned above are currently carried out.

Concerning the research done in tropical regions, the SFB564 project F1.2 constitutes the main activity: Tenure and Economic valuation of common-pool resources in mountainous regions of Thailand and Viet Nam (partners: Chiang Mai University, Kasetsart University, Thailand). This subproject performs a methodological comparison between the Contingent Valuation Method and participatory valuation methods before the socio-cultural background of Southeast Asia. The focus of the project is the economic valuation of an improvement of tap water quality in a watershed in northern Thailand.

Institute for Social Sciences for the Agricultural Sector

Chair: Rural Communication and Extension

Head: Prof. Dr. Volker Hoffmann

The research topics of this chair deal with farmers' knowledge systems and their change over time, and with the development and applied research and adoption of participatory approaches. Another research area is the relationship between humans and nature, change processes within organisations, methods for promoting adoption and

problem solving processes as well as rural livelihoods.

The focus is mostly on rural development and includes also participatory research methods in agricultural research as study object.

The following topics have been tackled during the past two years:

- The agricultural knowledge system and indigenous practices of Palestinian farmers in rainfed agriculture. Responsible researcher: Ismail Daiq; Country: Palestine; Partner organisations: Rehovot University Israel, PARC Palestine.
- Approaching vulnerability – rural livelihoods in the West Bank, Palestine. Responsible researcher: Bettina Dengler; Country: Palestine; Partner organisations: Rehovot University Israel PARC Palestine.
- Socio-cultural factors influencing the economics of African farm-household systems. Case study in Bakossiland, South-West Province, Cameroon. Responsible researcher: Ekane Halle; Country: Cameroon; Partner organisation: Friedrich-Ebert-Foundation.
- Cities feeding their people. Support measures for the promotion of urban agriculture and urban cities in the case of Dar es Salaam / Tanzania. Responsible researcher: Petra Jacobi; Country: Tanzania; Partner institutions: GTZ Urban Vegetable Promotion Project Tanzania, Ministry of Agriculture and Cooperatives.
- Participatory procedures for multi-purpose forage based technologies in Central-American hillsides. Responsible researcher: Rein van der Hoek; Country: Honduras; Partner institutions: CIAT, Colombia, BMZ.
- Linking small-scale farmers to output markets: - A situation analysis in selected African countries. Responsible researcher: Stefan Canz, Countries: Malawi; Kenya, South Africa. Partner institution: GTZ.
- Mensch und Natur in Mauretanien. Zum Verhältnis ehemaliger Nomaden zur Natur und zu ihrem Schutz; Responsible researcher: Valerie Lehmann-Horn, Country: Mauretania, Partner institution: GTZ.
- Enhancing access to genetic diversity through scaling up participatory plant breeding: Roles of different types of farmers and development organisations in Mali. Responsible researcher: Sonja Siart, Country: Mali, Partner organisation: ICRISAT/BMZ.
- The agricultural knowledge and information system in Tigray, Ethiopia: Empirical study about its recent history and actual effectiveness. Responsible researcher: Mamusha Lemma. Country: Ethiopia, Partner organisations: DAAD/ZEF.
- Building participatory processes for developing and dissemination of multipurpose forage technologies in Latin America. Responsible researcher: Hernandez, Luis Alfredo; Country: Honduras, Partner organisation: CIAT, Colombia/BMZ.
- Urban Agriculture as an Integrative Factor of Urban Development, Casablanca. Responsible researcher: Maria Gerster-Bentaya, Partner organisation: BMBF, TU Berlin.
- Situationsanalyse zur Wirtschaftsberatung für intensive Milchproduktion in der Mongolei. Country: Mongolei, Responsible researcher: Erdenebolor.
- Determination of high-potential aquaculture development areas and impact in Africa and Asia. Responsible researcher: Kriesemer, Simone. Countries: Bangladesh, China, Malawi, Cameroon. Partner organisations: WFC/ICLARM, BMZ.
- Seed system analysis in the frame of the research project on „Arresting the scourge of striga on sorghum in Africa by combining the strengths of marker-assisted backcrossing and farmer participatory selection. Responsible researcher: Netra Bhandari, Countries: Kenya, South Sudan and Eritrea, Partner organisations: ICRISAT, BMZ.
- Demonstrations (Beispiels-)Betriebe für moderne Mechanisierungssysteme im russischen Getreide- und Futteranbau. Responsible researcher: Eberhard Huber, Country: Russia.
- Utilisation of non-wood forest products by farmers in China. Responsible researcher: Julia Schmitt, Country: China.

5.5 Thematic group IV Agricultural Engineering and Food Technology

Special:

High-value products from tropical and subtropical fruits – sustainable concepts for integrated fruit processing

Similar to vegetables, fruit belongs to the high-valued agricultural commodities and their production and marketing are an important source of cash income for small-scale farmers in the northern parts of Thailand. This is because the specific agro-ecological situation renders the production of common staple crops less efficient compared with other regions. It has been assumed that the cultivation of perennial fruit trees has contributed to erosion control to a much larger extent and consume less water in irrigated agriculture compared to most annual crops. Technological options are required for diversified fruit utilisation at an intermediate and low level with respect to regional added value. This should lead to an increase in overall productivity by reducing post-harvest losses due to seasonal over-production, short harvest periods and insufficient access to markets. The purpose of diversification is to use various quality types and size classes of raw fruits in addition to fresh fruit marketing. Furthermore, optimised fruit products for various markets are needed, since local industrial fruit processing is mainly export oriented. As recent free trade agreements and market liberalisation have increased national and international competition, which is partly responsible for significant price decreases, product differentiation promoting niche products is coming to the fore. Globalisation may well induce further changes in agricultural and food markets in developing countries, also due to changing demands in urban centres and supply chains. High-value products and the need for product differentiation may become increasingly important, in particular for the small farm sector.

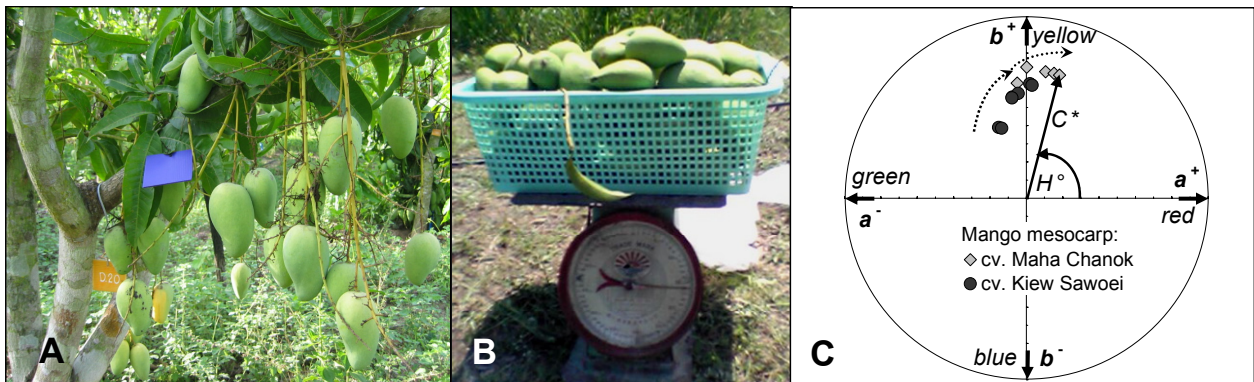
In the chair group “Plant Foodstuff Technology”, research is aimed at the development of integrated processing concepts for tropical and subtropical fruits, as shown for mango fruits (*Mangifera indica* L.). Respective studies on this fruit have been carried out in the interdisciplinary context of the Uplands Program (SFB564). Depending on the scale and type of production systems, subtropical mangoes offer interesting options for farmers in the Southeast Asian highlands. This is a provitamin A source and a cash crop with high export potential both as fresh and processed fruit. Therefore, a primary aim has been to identify the potential of northern Thai mango cultivars for product differentiation, particularly as to the health attributes of mango products, contributing to a generally improved provitamin A supply. Vitamin A deficiency has been known as a public health problem in more than half of all countries in the world, especially in Africa and Southeast Asia.



Flowering mango tree

Generally, the production of high-quality food equally depends on the selection of suitable raw material and on the appropriate processing technology. Therefore, our approaches in research refer to the whole food chain. This ranges from the characterisation of maturity, quality and safety attributes of the raw fruit through the optimisation of processes at the laboratory and pilot-plant scale, to the recovery of bioactive or techno-functional by-products with the simultaneous minimisation of processing waste.

In fruit processing, climacteric fruit species may be distinguished from non-climacteric ones as regards the handling of the raw material. Non-climacteric species are processed directly after harvesting to maintain optimal fruit quality, but climacteric fruits, like mangoes, are harvested at their mature-green stage with subsequent post-harvest ripening, to reach optimal ripeness for consumption or processing. The climacteric phenomenon is characterized by a rise in respiratory gas exchange. Whereas most climacteric fruits display this respiratory trend on or off the tree, some mango varieties present notable exceptions, because they fail to ripen when attached to their parent tree. Detachment usually induces the emergence of the respiratory peak and ripening. Proper physiological maturity at harvesting and control of post-harvest ripening are thus decisive factors in the production of high-quality mangoes for consumption. However, different mango cultivars are generally consumed or processed at different maturity stages, E their specific sensory profiles of their major properties are a result of the post harvest differential development. These include softening, formation of yellow-orange pigments, sugar accumulation and acid degradation. The carbohydrate and organic acid metabolism result in an increasing sugar-acid ratio. Knowledge of the cultivar-specific post-harvest ripening characteristics allows us to distinguish cultivars that are abundant or deficient in provitamin A and to define options for processing mangoes at well-defined, appropriate ripeness for different applications. Monitoring of post-harvest ripening changes, affecting sensory perception (appearance and aroma), nutritive quality and processibility involve a broad range of chemical, physical, and biochemical methods to quantify individual components, chemical characteristics, textural and colour properties, and relevant enzyme activities. For raw material selection and sorting processes in practice, easily accessible indicators for the nutritive value (provitamin A) and post-harvest ripeness have been deduced from the ripening characteristics of the cultivars studied.



Colour changes of ripening mango fruits: **A**, Mango tree at harvest; **B**, Mangoes harvested at their green-mature stage; and **C**, Illustration of measured postharvest changes of the mesocarp colour of selected Thai cultivars within the CIE-Lab colour space (a colour vector characterized by chroma (C^*) and hue angle (H°) is exemplarily shown for the yellow-orange fruits obtained after postharvest ripening of cv. Maha Chanok).

The contribution of mango fruits and products to provitamin A supply are determined by their content of β -carotene stereoisomers. The effects of thermal treatments applied at various intermediate processing stages and in final preservation as well as concurrent exposure to light and oxygen on β -carotene degradation and isomerization are of utmost interest in mango processing. To optimize provitamin A retention during processing and storage, the effects of individual processing parameters on β -carotene stability have been studied, based on statistical experimental designs for fruit processing on a laboratory or pilot-plant scale. Furthermore, complete pilot-plant processes have been explored with step-wise process control of β -carotene levels at each stage, quantifying β -carotene spectrophotometrically by high-performance liquid chromatography (HPLC) with diode array detection (DAD).



In industrialised mango processing, productivity could be further increased by the transformation of waste into by-products. Compared to fruits of temperate zones, considerably higher ratios of by-products arise from tropical and subtropical fruit processing due to higher amounts of inedible waste material such as peels and seeds, amounting to 35-60% of the total fruit weight for mango with 15-30% of peel and 10-30% of stone.



Tubular heat-exchanger used for controlled continuous thermal treatments of purées and juices at pilot-plant scale.

Efficient, inexpensive and environmentally sound utilisation of plant waste material is becoming more important to increase the profitability of fruit processing. Mango is

considered as being a potential source of pectin because of its high pectin content and its overall availability in large quantities. Pectins extracted from the peels and residual pulp may be promising by-products for further use as gelling agents, stabilisers or biological fibres in food and non-food applications. However, the composition and functional properties of pectins also depend on the processed raw material and the processing technologies used in the production of the main and by-product. Due to their role in fruit softening, the quality and yield of extractable pectins are furthermore closely related to the maturity of the processed raw material. Consequently, we have studied various aspects of pectin extraction from processing waste produced from northern Thai mango cultivars. For this purpose, the composition and techno-functional properties of pectins extracted from fruits and industrial waste samples have been characterized.

On the whole, plant-physiological and technological prerequisites regarding optimum product qualities in integrated mango processing have been evaluated to identify options for further diversification in the production, processing, and utilization of northern Thai mango cultivars. Furthermore, potentials, ts and tutional premises of individual technical solutions need to be identified.

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The thematic group IV „Agricultural engineering and food technology“ consists of 16 persons (Annex 2).

Institute for Agricultural Engineering

Chair: Mechanisation and Irrigation Technology

Head: Prof. Dr. K. Köller (on 31/12/2004 this chair was closed and since 01/01/2005 Prof. Köller holds the chair of Process Engineering in Plant Production)

The utilisation of water and energy resources increasingly gained a public prominence in the course of the last years. Soil conservation leads to an advanced impact on sustainability and environmental protection to land use. Water holding characteristics are potential to be raised by the use of natural cycles. Additional water supply is imperative to enable suitable systems of agriculture in arid and semi-arid areas. Technological and strategic improvements increase its efficiency. Site specific farming stands for innovative solutions, improving efficiency and creating benefits in agricultural production.

Current research of Agricultural Engineering's section Mechanisation and Irrigation associates measures of yield progression and food security to methods of sustainable production. Soil conservations and direct seeding connote the major impact on a reduction of erosion effects. Further emphasis is displayed by resource relevant optimisations through precision farming actions with respect to water and energy saving.

Reserach projects in the report's period:

MECHANISATION

Comparative studies on the efficiency of direct seeders

Cooperation and funding: John Deere, Moline (USA), Mannheim, Zweibrücken (Germany).

Approach and objective:

- Development and evaluation of examination methods to determine seeding accuracy of direct seeders;
- Test and evaluation of novel direct seeders.

Results:

- Development of multiple alignment versions;
- Comparative field trials for direct seeder's constructive removal of line clearing units are positive correlated with seeding quality and emergence rate.

Development of an expert tool for site specific drilling

Cooperation and funding: John Deere, Moline (USA), Mannheim, Zweibrücken (Germany).

Approach and objective:

- Development of compiling algorithms for application maps of cereal seeding;
- Implementation and evaluation of site specific drilling.

Results:

- Creation of a database to access the described algorithms;
- Algorithm approaches;
- Field trial verification of further statements known from literature in respect to application rate variation.

Development of an online TDR probe, to determine soil moisture contents fluently

Cooperation: IMKO, Micromodultechnik GmbH, Ettlingen (Germany).

Foundation: German Federal Ministry for Education and Research (BMBF), Bonn (Germany).

Approach and objective:

- Comparison and evaluation of probe geometry variation to enable fluent field measurements;
- Element of suitable material for the dynamic basic tool.
- Development of a dynamic field moisture gauge.

Results:

- First experiments showed a flexible capability of the dynamic moisture gauge;
- First trials showed a flexible utilisability of the TDR technique, therefore suitability for dynamic purposes was proved;
- Compilation of debut probe design respective to soil sensor contact while proceeding in top soils;
- Concepts of mobile measurements for premier field trials;
- Field trials with conventional sensors on inhomogeneous soils.

Development of a mulch- and directseeding qualified sugar beet single grain seeder

Cooperation and Foundation: Wohlfahrtsfonds der Deutschen Zuckerindustrie e.V.

Approach and objective:

- Evaluation of up-to-date technology
- Technical advances on single - grain seeders
- Development of new seeding devices for single – grain application of sugar beets

Results:

- First partial results: Compilation of a task - catalogue for an optimised seedbed under mulch and direct – seeding conditions
- Comparison of conventional techniques

IRRIGATION TECHNIQUE

Irrigation- and fertigation - scheduling for litchi and mango under conditions of water-savings and optimized nutrient supply

Cooperation: Chiang Mai University and Mae Jo University (Thailand).

Foundation: Deutsche Forschungsgesellschaft (SFB564).

Approach and objective:

- Analysis of Partial Rootzone Drying (PRD) on tropical fruit trees.
- Development of adapted irrigation- and fertigation - strategies
- Participatory evaluation of irrigation systems

Results:

- Microirrigation is already installed for one year on plot trials
- Comparison of PRD and alternative irrigation strategies in relation to droughtstress and yield.

Chair: Agricultural Engineering in the Tropics and Subtropics

Head: Prof. Dr.-Ing. Dr. h.c. Werner Mühlbauer (till 30/09/04)
Prof. Dr. Joachim Müller (since 01/10/04)

The chair of Agricultural Engineering in the tropics and subtropics is primarily engaged in interdisciplinary research in order to protect water as a natural resource and to conserve energy. Due to the fact that certain production processes such as drying are particularly high in energy consumption,

post-harvesting technology will demand special attention. The combination of basic and applied research enables a technology to be developed that will, with the cooperation of industry, be ready for the market and can therefore be put into practise.

Research projects 2004/2005:

Alternative Energy:

- The utilisation of vegetable oil as fuel (The Philippines, Tanzania);
- Optimisation of energy consumption for a rice drying plant;
- The development of a photovoltaic powered cereal mill;
- Solar drying of wood shavings;
- Solar drying and processing of sewage waste.

Irrigation:

- The development strategies to combat water shortages;
- The development of automatic controlled irrigation systems.

Post harvesting technology:

- The investigation of fermentation and drying characteristics of cacao (Indonesia);
- The solar drying of tropical fruit (Thailand, Brazil);
- The solar drying of fish (Bangladesh);
- The storage of rice under atmospherically controlled conditions (Sri Lanka);
- The investigation of abaca fibre when applied in the motor industry.

Institute for Food Technology

Chair: Section Plant Foodstuff Technology

Head: Prof. Dr. habil. Reinhold Carle

The research area of the Plant Foodstuff Technology chair includes the optimisation of technologies for processing plant raw material into solid and fluid products together with the assessment of product-specific chemical quality parameters. Research activities are

aimed at the preservation of plant-based food maintaining at the same time their health and their product-specific sensorial properties by gentle and sustainable processing technologies. The process development includes the chemical and physical characterisation of the technologically relevant properties of both raw material and the final product. This includes the textural properties of solid foods and the rheology of fluid products, respectively. Another major research topic is dedicated to the removal of antinutritive and allergenic compounds from the plant material by adequate technological measures.

The following research projects related to tropical foods have been carried out during the report period:

Enzymatic induction of fruit and vegetable firming:

- Production of firmed fruit and vegetables by combination of cold, high pressure and heat treatment.

Quality improvement of fruit juices and turbid fruit drinks:

- Development of a process for the improvement of haze yield and haze stability of fruit juice preparations;
- Assessment of physical and chemical properties related to the production of fruit juices from tropical fruits with a special focus on enzymatic peeling strategies;
- Investigations on the chemical quality and processing of exotic fruits.

Rheological characterisation of complex food systems:

- Prospective evaluation of the haze stabilising potential of fruit and vegetable concentrates including the technological improvement of products derived there from;
- Hydrocolloid characterisation in fluid, semi-solid, and solid food.

Characterisation of food with special emphasis on bioactive compounds:

- Impact of food technology on the contents and the bioavailability of anthocyanins, betalains, carotenoids and polyphenolics;
- Investigations on the alteration of the

allergenicity of fruit and vegetables during processing;

- Development of alternative strategies for condiment processing.

Unit: Food Analysis

Head: Prof. Dr. Heinz-Dieter Isengard

Water content has, via water activity, a great influence on the stability and, thus, the shelf life of foods. Water content affects also other properties and is therefore important in many respects. The analysis of water content *ad ather* activity is relevant for the control of raw materials, the production of foods and storage. This is particularly essential in tropical and subtropical environments.

Various works were carried out in this field:

This concerns issues in the context of reference materials. Specifications are either referred to dry matter or to the water content which was measured just before filling the material in the container. When the water content of the material changes, the specifications become wrong, a fact which has serious consequences particularly for reference materials. Before the use of such materials, a water determination would be recommendable. Water content is very often measured by drying techniques, which do not detect water specifically but all substances volatile under the conditions applied. It could be shown that a complete evaporation of the water is often not possible, because the enthalpy of evaporation of the "last" layers of water is very high. Selective water detection is possible by the Karl Fischer titration. To judge the situation, adsorption isotherms are helpful. They have been recorded for several reference materials.

In cooperation with the International Dairy Federation (IDF) a method for determining water content of butter oil by Karl Fischer titration was developed and presented at several scientific events and by publications. It was positively tested in an international interlaboratory test. The results were presented and discussed during the Analytical Weeks 2004 and 2005 in Parma (Italy) and

Magaliesburg (South Africa), organised by IDF and ISO. The method is now in a voting process by National Committees who are member of IDF and the International Organisation for Standardization (ISO).

A method for water determination in dried dairy products was proposed at the Analytical Week 2005 of IDF and ISO in Magaliesburg, South Africa. In spite of the scientific acceptance, important industrial enterprises opposed against the introduction of the method. The reason is that these products are sold on the basis of dry matter. The proposed method detects the water content completely and yields, consequently, higher values than the drying method applied so far.

This discrepancy between scientific correctness and truth on the one hand and political and economic interests on the other hand were addressed at several occasions.

Other works concerned wheat semolina and honey. In the context of honey, it was investigated if benzaldehyde, a bee repellent used in some countries during harvesting honey, can be detected in honey. Another field was the detection of fermentation products in honey.

A lecturer from the University of Makassar, South Sulawesi, Indonesia, visited the Food Analysis Unit and worked in the field of water determination of Indonesian products.

The stability of fats and oils during frying processes were further investigated. The effect of antioxidants was studied.

Another activity concerned the search for an alternative of (protected) sandalwood as a dye of foods. It could be shown that it can be replaced for many purposes by peels of roasted hazelnuts and by onions. The extracts of these products proved to be even more stable against light and heat and they had anti-oxidative properties. These findings have an enormous environmental dimension.

6 Publications

6.1 Publications in peer reviewed journals

- ABDEL-GHANI A.H., H.K. PARZIES, A. OMARY & H.H. GEIGER** 2004. Estimating the outcrossing rate of barley landraces and wild barley populations collected from ecologically different regions of Jordan. *Theor. Appl. Genet.* 109: 588–595.
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- YAZGAN S.** 2004. Moisture in dry powder – important or not? 1st IRMM's Research Fellows Workshop, European Commission; Joint Research Centre, Institute for Reference Materials and Measurements (IRMM), Geel, Belgium 18th June, 2004.
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- ZADRAVEC, K., H. KERWIN & H.-D. ISENGARD** 2005. Determination of tocopherols in vegetable oils by HPLC – Stability of tocopherols. Poster: 26th World Congr. & Exh. of the Intern. Soc. for Fat Research (ISF), Modern Aspects of fats and oils – A fascinating source of knowledge, Prague, Czech Republic, 25-28 Sept. 2005.
- ZERMANE N., J. KROSCHEL & T. SOUISSI** 2004. Options for biological control of parasitic weed *Orobanche* in North Africa. *In*: PETERS K.J. et al. (eds): Rural poverty reduction through research for development and transformation. Poster: Deutscher Tropentag 2004 Berlin, Book of abstracts, Druckhaus köthen, Köthen. pp. 210.

6.5 Invited talks

- BANSBACH P.** Master of Agribusiness – Organisation, structure and improvements. Tempus Workshop, Faculty of Agriculture, University of Zagreb, Croatia, 01.06.2004.
- BANSBACH P.** Master of Agribusiness. Vortrag für Tempus (Taxis) Joint European Project: Internationalisierung der ökonomischen Ausbildung an der Staatlichen Agraruniversität Stravopol, Universität Hohenheim, Stuttgart, 26.01.2004.
- BECKER K.** Bio-energie: chance für die weniger entwickelten Regionen? Journalistenseminar - Handel, Hunger & menschengemachte Katastrophen - Folgen für uns und Lösungsansätze aus der Wissenschaft, October 9-10, 2005, Universität Hohenheim, Germany.
- BECKER K.** Lecture: Biofuels from eroded soils. Tropenzentrum, Universität Hohenheim, Hohenheim. Germany, December 2004.
- BECKER K.** Lecture: Die Jatropha Pflanze als Biodiesel-Lieferant in der Dritten Welt - Möglichkeiten und Probleme der Jatropha Nutzung im südlichen Afrika. Jahresversammlung der Nord-Süd-Initiative e.V., Neuendettelsau, June 6, 2005.
- BECKER K.** Lecture: Die Jatropha-Pflanze als Biodiesel-Lieferant in der Dritten Welt - Chancen für die Unternehmenskommunikation. enviCom - forum über Umweltschutz, Nachhaltigkeit und CSR für Entscheider und Kommunikatoren in Unternehmen, Stuttgart, Germany, 26. April 2005.
- BECKER K.** Lecture: Jatropha Biodiesel from eroded land in India – potential for multiple benefits KfW Bankengruppe, Frankfurt, Germany, 1. März 2005.
- BECKER K.** Lecture: *Moringa oleifera* - an underutilized tree with amazing versatiliy. Son La, Vietnam/Viet Nam/Vietnam, June 2004.
- BECKER K.** Lecture: Nachwachsende Rohstoffe - eine Option für armutsorientierte Entwicklung. Fachtagung der BMZ/GTZ/BMVVEL, Niedernhausen, Germany, 16.-17. Juni 2005.
- BECKER K.** Lecture: Pflanzliche Saponine als Ersatz für Fütterungsantibiotika in der Tierernährung. Forschungsvereinigung der Arzneimittel-Hersteller e.V., Erfurt, Germany, Dez. 8, 2004.
- BECKER K.** Lecture: Vom Ödland zum Biokraftstoff – Chancen für die Dritte Welt Kongress des Jupiter Verlags, ISEO, DVR, „Neue Hoffnung für Erde und Menschheit“, Bregenz, September 9–11, 2005.
- BERGER T.** AGS Special Seminar: Empirical Application of Multi-Agent Systems to Water and Land Management. Invited lecture at Chiang Mai University in Chiang Mai, Thailand, 8. Aug 2005.
- BERGER T.** DFG-Roundtable: Interdisciplinary Modeling. Invited lecture for the Workshop “Water, Politics and Development” in Bonn, 21-22. Apr. 2005.
- BERGER T.** MED7 Meeting: Water Risk Management. Invited lecture for the “Thematic Workshop for the Definition of the Science and Technology Euro-Mediterranean Policy within FP7 on Water Risk Management and Renewable Energy Sources” in Athens, 16-17 May 2005.
- BUCHENRIEDER G.** Bedarfsorientierte Angebotspalette von Mikrofinanzinstitutionen: Sparen – Kredit – Versicherungen. Forum: Kongress zum UN-Jahr der Mikrokredite 2005. Stuttgart: Oikocredit Förderkreis Baden-Württemberg, Dachverband Entwicklungspolitik Baden-Württemberg, und Brot für die Welt. 490Zeller
- BUCHENRIEDER G.** Halten die Mikrokredite was sie versprechen: Überblick anlässlich des Jahrs der Mikrokredite 2005 der Vereinten Nationen. Dachverband der Oikocredit Förderkreise. Frankfurt: Zentrum Ökumene in Frankfurt Praunheim.
- BUCHENRIEDER G.** Mikroversicherungen als neues Instrument der Mikrofinanzierungen. Seminarvortrag "Mikrofinanzen". July 3, 2004. Frankfurt, D: Oikocredit (Ecumenical Development Cooperative Society).
- BUX M.** Thermische Nutzung von Solarenergie zur Trocknung von Holz und organischen Reststoffen. Berufungsvortrag, Brandenburgisch Technische Universität Cottbus, Cottbus, 02.09.2004.
- CADISCH G.** Herausforderungen in der Modellierung von Agrarökosystemen der Tropen und Subtropen. Symposium zu Ehren von Prof. Dr. Dr. h.c. E. A. Mitscherlich, Landwirtschaftlich-Gärtnerische Fakultät der Humboldt-Universität, Berlin.
- DOLUSCHITZ R.** Kooperation zwischen der Universität Hohenheim und der China Agricultural University – Entwicklung und Perspektiven. Veranstaltung der DFG, Haus der Wirtschaft, Stuttgart, 29.09.2004.

- DOPPLER W. & DO ANH TAI** New methodologies for the Farming System Research in the mountains of Viet Nam. Thai Nguyen University of Business Administration and Economics, Viet Nam. December 2005:
- DOPPLER W.** Challenges in mountain farming and rural systems of rural systems of South East Asia. Chiang Mai University. January 2004.
- DOPPLER W.** Farming and rural systems research for rural development – A case from Tocantins, Brazil. Faculdade Boa Viagem, Recife, Brazil. March 2004.
- DOPPLER W.** Farming and rural systems research for rural development. University of Alexandria, Egypt. February 2004.
- DOPPLER W.** New developments in quantitative methods in rural development. University of Nairobi, Kenya. February 2005.
- DOPPLER W.** Postgraduate training in Germany and future cooperation. DAAD Regional Office Nairobi. February 2005.
- FANGMEIER A.** Atmospheric CO₂ enrichment and ecosystem responses. China Agricultural University, Peking, China, 25.3.2004.
- FANGMEIER A.** Deposition of NH₃ and adverse effects on vegetation. China Agricultural University, Peking, China, 23.3.2004.
- FANGMEIER A.** Globaler CO₂-Anstieg in der Atmosphäre: nur Klimaveränderungen als Folge? Tag der Umwelt 2005 Hochschule Zittau/Görlitz, 2.11.2005.
- FANGMEIER A.** Klimaänderungen und die Folgen für die Landwirtschaft. Fachtagung "Warnsignal Klima: Wird Wasser knapper" in Karlsruhe, 8.3.2005.
- FANGMEIER A.** Tropospheric ozone as major air pollutant and recent research on effects. China Agricultural University, Peking, China, 24.3.2004.
- FISCHER I.** Application of PRA and picture supported communication in research projects. Lecture. Hanoi Agricultural University, May 04, 2005, Hanoi, Vietnam.
- FISCHER I.** Mikrofinanzwesen und Mikroversicherungen im ländlichen Raum Nordvietnams. Vortrag. München: Universität der Bundeswehr München, 07. November 2005.
- FOCKEN U.** Lecture: Fischmehl als Fischfutter: Problematik des Fischmehleinsatzes in der marinen Aquakultur und mögliche Alternativen (Fish meal as fish feed: The problem of using fish meal in marine aquaculture and possible alternatives) Faculty of Agricultural Science, University of Hohenheim, Germany, March 31, 2004.
- FOCKEN U.** Lecture: Stabile Kohlenstoff- und Stickstoff-Isotope in der Tierwissenschaft (Application of stable isotopes of carbon and nitrogen in animal sciences) Colloguy in Animal Science, University of Hohenheim, Germany, May 17, 2004.
- FOCKEN U.** Lecture: Tracing of nutrient flows by stable isotope data. Guest lecture in the post-graduate course "Environmental Sciences", Universidade Federal do Rio Grande do Norte (UFRN), Natal/RN, Brazil, April 20, 2005.
- FRIEDERICHSEN R.** Vietnamese researchers' discourse on montagnards and local evidence. Paper: Australian National University, Viet Nam Studies Summer School, Canberra, Jan. 2004.
- GÖLTENBOTH F.** Abaca Fiber - a natural resource for the automotive industry. Universidad Federal do Pará, Belem, Brazil. July 2004.
- HAUSSMANN B.I.G.** Advances in conventional breeding of open-pollinated populations and of hybrid varieties. One-day lecture within the joint "Istituto Agronomico per l'Oltremare" (IAO)/FAO Training course for African plant breeders on "Exploiting plant adaptation and biodiversity for higher and more stable yields". Florence, Italy, September 30, 2004
- HEIDHUES F. & S. DAUDE** The World Trade Organisation (WTO) in Vietnam Viet Nam Vietnam. Presentation at the Hanoi Agricultural University, Vietnam Viet Nam Vietnam, Mai 2004.
- HENNIGES O. & J. ZEDDI** Bioethanol – Ausreichende Rahmenbedingungen gegen die Konkurrenz aus Brasilien? Wirtschaftliche Vereinigung Zucker, Koordinationsausschuss, Berlin, 29. Juni 2004.
- HENNIGES O.** Competitiveness of Bioethanol Production in EU, USA and Brazil. Seminar on Agricultural Economics, Poznan University, Poznan/PL, 24. Juni 2004.
- HENNIGES O.** Competitiveness of Bioethanol Production in EU, USA and Brazil. Seminar of the Department of Economics, Kasetsart University, Bangkok/TH, 13. August 2004.

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- KHACHATRYAN N.** One-week lecture series on international agricultural trade at the Armenian Agricultural Academy, March Einwöchige Gastvorlesungsreihe zu “International Agricultural Trade” an der Armenian Agricultural Academy, März 2004.
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- STINTZING F.C.** Vortragsreihe an der Universidad de Costa Rica, 02.-06. August 2004
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6.6 Habilitationen (*postdoctoral qualification*)

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- BLÜMMEL M.** 2001/2004. Complementing *in vitro* gas volume measurements by residual substrate determinations for more comprehensive studies of microbial substrate degradation: opportunities and limitations. Faculty of Agriculture of the University of Hohenheim, Institute for Animal Production in the Tropics and Subtropics, Aquaculture-Systems and Animal Nutrition in the Tropics and Subtropics. 300 p.
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- BANDE M.** 2004. Development of a sustainable Abaca (*Musa textilis*) production in a diversified multi-strata agroecosystem in Leyte, Philippines. M.Sc. thesis. Institute for Plant Production and Agroecology in the Tropics and Subtropics, Prof. Joachim Sauerborn.
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- BORST D.** 2004. Microfinance – Theoretische Grundlagen für den Einsatz sowie die Abschätzung des Potentials anhand einer Datenbankuntersuchung zur Verwundbarkeit der ländlichen Bevölkerung in Vietnam. Diplomarbeit: University of Karlsruhe, Chair of Insurance Science and, University of Hohenheim, Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics, Prof. Franz Heidhues.
- CALLES T.** 2004. Biogeography of the tropical legume genus *Stylosanthes* in Venezuela. M.Sc. thesis. Institute for Plant Production and Agroecology in the Tropics and Subtropics, Prof. Rainer Schultze-Kraft.
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- DEREJE W.** 2004. Assessment of beekeeping management systems and potential honey source plants integrated with agroforestry farming in Ethiopia: a case study at Butajira area. M.Sc. thesis. Institute for Plant Production and Agroecology in the Tropics and Subtropics, Prof. Joachim Sauerborn.
- DONGMEZA E.B.** 2004. Effects of dehydrated moringa (*Moringa oleifera* Lam.) leaf extract and its fractions on growth performance and feed nutrient assimilation in tilapia (*Oreochromis niloticus* L.) 89 p. M.Sc. thesis. Institute for Animal Production in the Tropics and Subtropics, Prof. Klaus Becker.
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- GODWIN V.A.** 2004. Performance of progeny groups of Merinolandschafe with different allele configuration at prion protein locus: Weight development until slaughter and parasite infestation. M.Sc. thesis. Institute for Animal Production in the Tropics and Subtropics, Prof. Anne Valle Zárate. 480Valle
- GONZÁLEZ MELLADO A.A.** 2005. Determination of benzaldehyde in honey from different countries. M.Sc. thesis. Institute for Food Technology, Prof. Dr. Isengard.
- GOURIVEAU F.** 2004. Ecological and participatory assessment of the impact of silvopastoral systems on butterfly diversity in the seasonally dry tropics, Costa Rica. M.Sc. thesis. Institute for Plant Production and Agroecology in the Tropics and Subtropics, Prof. Rainer Schultze-Kraft.
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- HEYD H.** 2004. Sustainable watershed management in upland regions of northern Thailand – Analysis of stakeholders, policies and strategies in the upper Ping watershed. Master thesis, Hohenheim. M.Sc. thesis. Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics, Prof. Franz Heidhues.
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- HOA, P.T.T.** (2005):. Phenotypic and biometric characterisation of autochthonous Vietnamese ban pigs. M.Sc. thesis, Institut for Animal Production in the Tropics and Subtropics, Prof. Anne Valle Zárate.
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- HOFMANN S.** 2005. Enzymatische Verflüssigung von Ingwer und Untersuchungen zum Einfluß technologischer Maßnahmen auf den Erhalt qualitätsgebender Inhaltsstoffe. Diplomarbeit. Institut für Lebensmittelwissenschaft und Biotechnologie, Prof. Reinhold Carle.
- HÖNICKE M.** 2005. The role of indigenous vegetables for micronutrient consumption in Southeast Asia: A cross section analysis of indigenous vegetable consumption in the Philippines. M.Sc. thesis. Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics, Prof. Martin Qaim.
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- ISLAM M.** 2004. Solar drying of fish in Bangladesh. M.Sc. thesis. Institute for Agricultural Engineering in the Tropics and Subtropics, Prof. Karlheinz Köller.
- ISTEITIEH M.** 2005. Genetic diversity of barley landraces and wild barley populations from Jordan. M.Sc. thesis. Institute for Plant Breeding, Seed Science and Population Genetics, Prof. Hartwig H. Geiger.
- JAFFÉ LOPEZ M.I.** 2005. Impact of cooperative membership on family income of smallholders – The case of coffee farmers in Venezuela. Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics, Prof. Werner Doppler.
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- KANJINA S.** 2005. Participatory approaches in tropical agricultural research in German universities: A case study of crop sciences. M.Sc. thesis. Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics, Prof. Franz Heidhues.
- KAPAJ I.** 2004. Decision-making on quality management in the meat processing industry in Albania. M.Sc. thesis. Institute for Farm Management, Prof. Reiner Doluschitz.
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- KNÖDLER M.** 2004. Gewinnung von Pektin und Polyphenolen aus Reststoffen der Mangoverarbeitung. Diplomarbeit. Institut für Lebensmitteltechnologie, Prof. Reinhold Carle.
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- LAWAL O.M.** 2004. Estimation of land use changes on catchment hydrology and sediment load in Southern Benin. 84 p. Institute for Soil Science and Land Evaluation, Prof. Karl Stahr.
- LINH N.** 2004. Participation in extension organizations in northern Viet Nam. M.Sc. thesis. Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics, Prof. Franz Heidhues.
- MAIER C.** 2005. Einfluss verschiedener Erhitzungs- und Lagerbedingungen auf die Betalainstabilität in Kaktusfruchtsäften. Diplomarbeit. Institut für Lebensmitteltechnologie, Prof. Reinhold Carle.
- MANE A.** 2004. Comparative advantage of oil production in Albania. M.Sc. thesis. Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics; Prof. Matthias von Oppen.
- MARITZ H.J.** 2004. Evaluation of camel health management practises of Rendille pastoralists in Marsabit District, Kenya. M.Sc. thesis. Institute of Institute for Animal Production in the Tropics and Subtropics, Animal Breeding and Husbandry, Prof. Anne Valle Zárate.
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- MAURER C.** 2004. Strömungstechnische Untersuchungen der Gleichförmigkeit von Emittlern zur Mikro-Bewässerung. Institut für Agrartechnik in den Tropen und Subtropen, Prof. Karlheinz Köller.
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- MÜHLBAUER B.** 2005. Mathematische Modellierung und Simulation der solaren Klärschlamm-trocknung Studienarbeit. Institute for Agricultural Engineering, Prof. Joachim Müller..
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- NANDETY A.** 2005. Genetic Diversity of Sudanese Sorghum Landraces based on Microsatellite Markers. M.Sc. thesis. Institute for Plant Breeding, Seed Science and Population Genetics, Prof. Hartwig H. Geiger.
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- NDANGAM E.** 2005. Water content determination in anhydrous milk fat by coulometric Karl Fischer titration. Institute for Food Technology, Prof. Heinz-Dieter Isengard.
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- NSENGIYUMVA A.** 2005. Potential of the EPIC model to simulate the N dynamics within 2 ground water protection sites under organic farming in the State of Baden Württemberg, Germany. M.Sc. thesis. Institute for Soil Science and Land Evaluation, Prof. Karl Stahr.

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- REIBER C.** 2004. Potential and constraints of cowpea (*Vigna unguiculata*) in Honduran hillsides. M.Sc. thesis. Institute for Social Sciences in Agriculture, Prof. Volker Hoffmann.
- REINTJES K.** 2005. Entwicklung, Validierung und Applikation einer GC-MS-Methode zur Bestimmung von Paclobutrazol-Rückständen in Mango- und Bodenproben. Diplomarbeit. Institut für Lebensmitteltechnologie, Prof. Reinhold Carle.
- RESCH A.** 2004. Stabilität von Pektinesterase und Peroxidase in verschiedenen Citrusarten und -sorten. Diplomarbeit. Institut für Lebensmitteltechnologie, Prof. Reinhold Carle.
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- RUSEV T.** 2005. Agricultural knowledge and information system in Macedonia. M.Sc. thesis. Institute for Social Sciences in Agriculture, Prof. Volker Hoffmann.
- SAUTTER J.** 2005. Die Eignung von *Panagrellus redivivus* als Lebendfutter in der Larvenernährung des Fiederbartwelses *Synodontis petricola*. M.Sc. thesis. Institute for Animal Production in the Tropics and Subtropics, Prof. Klaus Becker.
- SCHOLZ-HORVAT C.** 2004. Leistungsvergleiche zwischen Nachkommengruppen von Merinolandschafen mit unterschiedlicher Allelkonfiguration am Prionproteinlocus hinsichtlich Vitalität, Gesundheitsstatus und Gewichtsentwicklung bis zum Absetzen. Diplomarbeit. Institut für Tierproduktion in den Tropen und Subtropen, Tierhaltung und Tierzucht, Prof. Anne Valle Zárate.
- SCHULZ T.** 2005. *Brachiaria* hay and silage as improved feed options for Latin American smallholders. M.Sc. thesis. Institute for Plant Production and Agroecology in the Tropics and Subtropics, Prof. Rainer Schultze-Kraft.
- SCHUMM C.** 2005. Bioindikation von Fluoridbelastungen in der Umgebung eines Emittenten. Diplomarbeit. Institut für Landschafts- und Pflanzenökologie, Prof. Andreas Fangmeier.
- SOMUAH R.** 2004. The impact of forest resources on the standards of living of the forest communities. A case from Kwaebibirim district of the Eastern Region, Ghana. M.Sc. thesis. Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics, Prof. Werner Doppler.
- STANLEY C.** 2005. Assessment of strategies to overcome constraints in the exploitation of *Stevia rebaudiana* Bertoni (Bert) in Paraguay. M.Sc. thesis. Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics, Prof. Matin Qaim.
- STEIN C.** 2004. Raten der Bodenentwicklung in einer Bodenchronosequenz auf marinen Terrassen am Golf von Metaponto, Süd-Italien. M.Sc. thesis. Institut für Bodenkunde und Standortslehre, Prof. Karl Stahr.
- SUMBOH A.** 2004. The Impact of women and child labour on the economies of fast developing countries. M.Sc. thesis. Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics, Prof. Franz Heidhues.
- SUN Y.** 2005. Effects of elevated CO₂ concentration on photorespiration related enzymes and soluble proteins in leaves of wheat and associated weeds. M.Sc. thesis. Institute for Landscape and Plant Ecology, Prof. Andreas Fangmeier.

- TIRUKOLEVA S.** 2004. Study of native starch systems for dehydrated and agglomerated culinary products. M.Sc. thesis. Institute for Agricultural Engineering, Prof. Werner Mühlbauer.
- TOKU W.-H.** 2004. Factors affecting the adoption and diffusion of agro-forestry in the Sefwi Wiawso District of Ghana. Institute for Social Sciences in Agriculture, Prof. Volker Hoffmann.
- TÖPFER N.** 2004. Ernährungszustand von Kindern und Jugendlichen in Ladakh. Einfluss traditioneller Lebensmittel bzw. Stellung traditioneller Lebensmittel in der Mikronährstoffversorgung. Diplomarbeit. Institut für Biologische Chemie und Ernährungswissenschaft, Prof. Hans Konrad Biesalski.
- TRAIKOVA D.** 2005 Gender differences in non-farm rural employment – the case of Bulgaria. M.Sc. thesis. Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics, Prof. Franz Heidhues.
- TRICHTERBORN J.** 2005. Sensory and key aroma compound mapping of ready-to-drink coffee beverages. Diploma thesis. Institute for Food Technology, Prof. Reinhold Carle.
- VON WUTHENAU M.** 2004. The suitability of the free living nematode *Panagrellus redivivus* as live food for first feeding *Litopenaeus vannamei* larvae. 86p. Institute for Animal Production in the Tropics and Subtropics, Prof. Klaus Becker.
- VUGRINEC S.** 2004. Versuche zur Bestimmung von freiem und Gesamtwasser in Lactose mittels Karl-Fischer-Titration, niedrig-auflösender Kernresonanzspektroskopie und Trocknung. Institut für Lebensmitteltechnologie, Prof. Heinz-Dieter Isengard.
- WEIS K.** 2005. Solargestützte Trocknung einheimischer Holzarten in der Provinz Chaco, Argentinien. Diplomarbeit. Institut für Agrartechnik, Prof. Joachim Müller.
- YONGHACHEA P.F.** 2005. Farmers' perceptions of *Imperata cylindrica* and *Chromolaena odorata* fallows in the North-West, South-West and Littoral provinces of Cameroon. M.Sc. thesis. Institute for Plant Production and Agroecology in the Tropics and Subtropics, Prof. Rainer Schultze-Kraft.
- YONUSHONIS CH.** 2005. Control of *Conopomorpha sinensis* bradley in the lychee orchards of northern Thailand. M.Sc. thesis. Institute for Plant Production and Agroecology in the Tropics and Subtropics, Prof. Joachim Sauerborn.
- YUXIA L.** 2004. Environmental management and energy – A study about energy crisis & energy-related global warming issues. M.Sc. thesis. Institute for Landscape and Plant Ecology, Prof. Andreas Fangmeier.
- ZADRAVEC K.** 2005. Untersuchung der Stabilität von Vitamin E in verschiedenen pflanzlichen Fetten und Ölen. Institut für Lebensmitteltechnologie, Prof. Heinz-Dieter Isengard.

6.9 Bachelor theses

- BANTHLEON G.** 2005. Importance of world trade with tropical crops for global nutrient transfer to Germany. Institute for Plant Production and Agroecology in the Tropics and Subtropics, Prof. G. Cadisch.
- FUERTEZ PÉREZ D.** 2005. Drinking water supply and quality along Mae Sa watershed in Northern Thailand. Institute for Agricultural Engineering, Prof. Joachim Müller.
- GAERTNER A.** 2005. Organic livestock farming in Spain and Iberoamerica – state and perspectives. Institute for Animal Production in the Tropics and Subtropics, Prof. Anne Valle Zárate.
- GOETJES P.** 2004. Stickstoffvorrat sowie Stickstoffmobilität in Flächen des ökologischen Landbaus. Institut für Bodenkunde und Standortslehre, Prof. Karl Stahr.
- KOHL S.** 2004. Crop evaluation for water harvesting systems in the mountainous region of Northwest Thailand. Institute for Soil Science and Land Evaluation, Prof. Karl Stahr.
- KÖMLE S.** 2004. Auswirkungen des Befalls mit *Orobancha ramosa* auf Raps. Institut für Pflanzenproduktion und Agrarökologie in den Tropen und Subtropen, Prof. Joachim Sauerborn.
- MAIER R.** 2004. Standortseigenschaften für Baumwolle in einer Kleinlandschaft in Zentralbenin. Institut für Bodenkunde und Standortslehre, Prof. Karl Stahr.
- MAURER C.** 2004. Strömungstechnische Untersuchungen der Gleichförmigkeit von Emittlern zur Mikro-Bewässerung. Institut für Agrartechnik, Prof. Karlheinz Köller.
- MÜLLER C.** 2004. Correction factors of time-domain-reflectometry soil moisture measurements within the root zones of mango trees, Northern Thailand. Institute for Agricultural Engineering, Prof. K. Köller.

- WALZ M.** 2005. Untersuchung des Trocknungsverhaltens von Holzhackschnitzeln im Solartrockner. Institute for Agricultural Engineering, Prof. Joachim Müller.
- WEIß A.** 2005. Incorporating indigenous knowledge to scientific knowledge to support sustainable land use. Institute for Soil Science and Land Evaluation, Prof. Karl Stahr.

Tropical and development oriented publications of the different chair groups

	peer reviewed	non-reviewed journals	books/ book chapters	conference contributions	doctoral theses	diploma and M.Sc. theses
Institute for plant production and agroecology in the tropics and subtropics						
Plant production	18	-	16	16	3	-
Agroecology	13	4	4	22	8	5
Biodiversity and land rehabilitation	12	1	-	22	2	5
Institute for soil science and land evaluation						
Soil science and petrology	8	-	-	16	3	5
Institute for landscape and plant ecology						
Plant ecology and ecotoxicology	4	3	7	24	1	8
Institute for plant breeding, seed science and population genetics						
Plant breeding	6	-	-	2	3	-
Population genetics	5	-	-	8	1	2
Institute for biological chemistry and nutrition						
Biological chemistry and nutrition	4	1	-	5	-	2
Institute for animal production in the tropics and subtropics						
Animal breeding and husbandry	7	6	4	47	6	9
Aquaculture systems and animal nutrition	37	3	2	36	5	8
Institute for agricultural economics and social sciences in the tropics and subtropics						
Rural development economics and policy	15	12	12	52	6	16
International agricultural trade and food security	10	5	5	14	3	4
Farm and household systems in developing countries	-	-	2	22	8	2
Josef G. Knoll visiting professorship	-	-	1	2	-	2
Institute for economics						
Economics, esp. environmental economics and public policy	-	1	-	4	-	1
Institute for farm management						
Analysis, planning and organisation of agricultural production	-	1	-	-	-	1
Computer applications and business management in agriculture	1	-	2	4	-	1
Institute for social sciences for the agricultural sector						
Rural communication and extension	1	3	23	9	5	5
Institute for agricultural engineering						
Mechanisation and irrigation technology	-	11	2	8	1	9
Agricultural engineering in the tropics and subtropics	8	11	7	39	8	15
Institute for food technology						
Plant foodstuff technology	22	4	-	12	3	12
Food analysis	-	-	-	26	1	9
Apicultural state institute						
	-	-	-	2	1	1

Members of the Tropenzentrum (as in April 2006)

Title	Christian Name	Family Name	Institute	Phone	Fax	Email
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Members of the Tropenzentrum (as in April 2006)

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Members of the Tropenzentrum classified per thematic group

Thematic group I

Plant production and landscape ecology (43)

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Prof. Dr.	Reinhard	Böcker	320
Prof. Dr.	Heinrich	Buchenauer	360
Prof. Dr.	Georg	Cadisch	380
Prof. Dr.	Andreas	Fangmeier	320
PD Dr.	Sabine	Fiedler	310
Dr.	Elke	Fischer	380
PD Dr.	Anette	Fomin	320
Dr.	Thomas	Gaiser	310
Prof. Dr.	Hartwig H.	Geiger	350
Prof. Dr.	Friedhelm	Göltenboth	380
Dr.	Jan	Grenz	380
<i>Prof. Dr.</i>	<i>Wolfgang</i>	<i>Haubold</i>	<i>130</i>
Dr.	Ludger	Herrmann	310
<i>Prof. Dr.</i>	<i>Dieter</i>	<i>Hess</i>	<i>260</i>
Dr.	Thomas	Hilger	380
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<i>Prof. Dr. Dr. h.c.</i>	<i>Günter</i>	<i>Kahnt</i>	<i>340</i>
Prof. Dr.	Ellen	Kandeler	310
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Prof. Dr.	Volker	Römheld	330
Prof. Dr.	Joachim	Sauerborn	380
Dr.	Veronika	Scherbaum	140
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Prof. Dr.	Thilo	Streck	310
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Prof. Dr.	Claus P.W.	Zebitz	360

Thematic group II

Animal production (23)

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Prof. Dr.	Rolf	Claus	470
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	Michael	Frei	480
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Prof. Dr.	Wolfgang	Hanke	230
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Dr.	Ellen	Hoffmann	480
Dr.	Brigitte	Kaufmann	480
Prof. Dr.	Ute	Mackenstedt	220
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		Schultze	
Dr.	Herbert	Steingaß	450
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Italic: Professor emeritus / retired Professor

**Thematic group III
Agricultural economy
and sociology (24)**

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Prof. Dr.	Reiner	Doluschitz	410
Prof. Dr.	Werner	Doppler	490
	Oliver	Frör	520
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Prof. Dr.	Werner	Grosskopf	420
<i>Prof. Dr.</i>	<i>Franz</i>	<i>Heidhues</i>	<i>490</i>
Prof. Dr.	Arno	Henze	420
Prof. Dr.	Volker	Hoffmann	430
M.A.	Bernhard	Klocke	650
Prof. Dr.	Franz	Kromka	430
Dr.	Harald	Leisch	796
Dr.	Andreas	Neef	490
Dr.	Jens	Pape	796
Prof. Dr.	Matin	Qaim	490
<i>Prof. Dr.</i>	<i>Erwin</i>	<i>Reisch</i>	<i>410</i>
<i>Prof. Dr.</i>	<i>Matthias</i>	<i>von Oppen</i>	<i>490</i>
<i>Prof. Dr.</i>	<i>Günther</i>	<i>Weinschenck</i>	<i>410</i>
Dr.	Heinz- Peter	Wolff	490
Prof. Dr.	Jürgen	Zeddies	410
Prof. Dr.	Manfred	Zeller	490

Italic: Professor emeritus / retired Professor

**Thematic group IV
Agricultural engineering and
food technology (16)**

Prof. Dr.	Reinhold	Carle	150
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PD Dr.	Hartmut	Grimm	440
Prof. Dr.	Heinz- Dieter	Isengard	150
Prof. Dr.	Thomas	Jungbluth	440
Prof. Dr.	Siegfried	Kleisinger	440
Prof. Dr.	Karlheinz	Köller	440
Prof. Dr.	Volker	Kottke	150
Prof. Dr.-Ing.	Heinz- Dieter	Kutzbach	440
<i>Prof. Dr.-Ing. Dr. h.c.</i>	<i>Werner</i>	<i>Mühlbauer</i>	<i>495</i>
Prof. Dr.	Joachim	Müller	440
Dr.	Sybill	Neidhart	150
<i>Prof. Dr.</i>	<i>H. Joachim</i>	<i>Pieper</i>	<i>150</i>
Dipl.-Ing.	Helmut	Sinn	250
Dr.	Florian C.	Stintzing	150
<i>Prof. Dr.</i>	<i>Roland</i>	<i>Süßmuth</i>	<i>250</i>

TROPENZENTRUM – budget funds**Financial year 2004 – annual balance sheet**

Kapitel 1419, BA 790071

Revenues		Expenses (per type of costs)	
Assignment of the University	129 954.00	Scientific staff	75 447.95
Transfer from 2003	13 721.00	Assistants	0.15
Reward for third party funds	5 820.00	Communication	1 228.55
Sum of revenues	149 495.00	Equipment + events	3 550.94
Expenses	130 535.80	Travel costs	501.27
Balance 2004	18 959.20	Public relations	1 040.54
		Tropentag 2004	4 548.00
		Allocated of funds for core institutes (11 x 3 000)	33 000.00
		<u>Requested funds</u>	
		Focken (480b)	1 600.00
		Amselgruber (460a)	1 828.00
		Valle Zárate (480a)	750.90
		Carle (150d)	1 093.00
		Ahlheim (520f)	1 746.50
		Martin (380b)	2 700.00
		Korff (490e)	1 500.00
		Sum of expenses	130 535.80

TROPENZENTRUM – budget funds**Financial year 2005 – annual balance sheet**

Kapitel 1419, BA 790071

Revenues		Expenses (per type of costs)	
Assignment of the University	129 954.00	Scientific staff	73 339.11
Transfer from 2004	18 959.20	Assistants	2 505.89
Reward for third party funds	3 920.00	Communication	2 566.00
Means for assistance in AgEcon	2 000.00	Equipment + Events	11 208.78
Means for investments	10.000.00	Travel costs	3 414.00
Sum of revenues	164 833.20	Public relations	0.00
		Tropentag 2005	22 682.91
Expenses	153 522.69	Allocated funds for core institutes (10x3 000)	30 000.00
Balance 2005*	11 310.51	<u>Requested funds</u>	
		Stahr (310)	1 000.00
		Zeddies (410)	3 500.00
		Biesalski (140)	1 500.00
		Geiger (350b)	806.00
		Stahr (310)	1 000.00
		Sum of expenses	153 522.69

*) Transfer to financial year 2006 requested

Name	Supervisor	Topic	Country
Mathias Ganss	Korff	Acceptance of private sector capacity building and extension services in modern beekeeping, honey processing and marketing; a case study in Butajira, South-Western Ethiopia	Ethiopia
Fabrice Gouriveau	Schultze-Kraft	Ecological and PRA-based assessment of ant diversity in different land use systems in Costa Rica and contribution to the creation of a land use index to reward farmers for their environmental services	Costa Rica
Birgit Schaub	Kroschel / Marley	Field evaluation of <i>Fusarium oxysporum</i> based mycoherbicide for control of <i>Striga hermonthica</i> in West Africa	Nigeria
Helene Heyd	Heidhues	Sustainable watershed management in upland regions of northern Thailand - Analysis of stakeholders, policies and strategies in the upper Ping watershed	Thailand
Martha Oumer	Heidhues	Vulnerability of female headed households to livelihood insecurity in rural Ethiopia	Ethiopia
George Johnson	Heidhues	Reaching the rural poor with microcredit - The CRAN project in Ghana	Ghana
Sarwshri Gangurde	Martin	Abundance dynamics of selected arthropods in the course of rice plant growth in different rice agroecosystems of Leyte (Philippines)	Philippines
Marlito Bande	Martin	Development of a sustainable abaca (<i>Musa textilis</i>) production in a diversified multi-strata agroecosystem in Leyte, Philippines	Philippines
Kevin Weis	Mühlbauer	Entwicklung geeigneter Trocknungsregime für eine solare Holz-trocknungsanlage in der Region Chaco, Argentinien	Argentina
Susanne Kohls	Stahr / Herrmann	Eignung von Kulturarten zum Anbau in Water-Harvesting Systemen in Kalksteingebieten Nord-Thailands	Thailand
Samuel Antwi	Heidhues	Impact assessment of Kwahu rural bank credit scheme on beneficiaries in Kwahu-South District, eastern region, Ghana	Ghana
Olivier Ecker	Heidhues	Agricultural effects of large-scale infrastructure projects on rural poverty alleviation - An SAM-based multiplier analysis of Son La Province (northern Viet Nam)	Viet Nam
Regina Rössler	Valle Zárate	Determining selection traits for local pig breeds in northern Viet Nam: matching genetic and economic parameters with farmers' trait preferences and logistic determinants	Viet Nam

Annex 4

Name	Supervisor	Topic	Country
Annika Badorreck	Stahr	Charakterisierung von bodenchemischen und – physikalischen Eigenschaften als Basis für eine nachhaltige Landnutzung in Zimbabwe	Zimbabwe
Vanessa Prigge	Martin	Identifikation einheimischer Wildpflanzen aus indigenem Wissen im Hinblick auf ihre mögliche Integration ins Rainforestation Farming System in Leyte, Philippinen	Philippines
Josua Leistner	Streck	Comparison of nutrient flows and balances of different farm types in the Facara, Maradi and Zinder regions of southwest Niger	Niger
Kerstin Schöll	Bessei	Vergleich der Massnahmen zur Bekämpfung der aviären Influenza in Europa und Asien	Thailand / Viet Nam
Torsten Hüller	Stahr	Eignung lokaler Sorten für ein verbessertes Anbausystem im Karstgebiet Bor Krai, NordThailand	Thailand
Kathrin Reintjes	Carle	Entwicklung und Validierung einer GC-MS-Methode zur Bestimmung von Paclobutrazol-Rückständen in Mango- und Bodenproben	Thailand
Kamal Pathak	Streck	Simulation of effective anisotropy in hillslope soils of northern Thailand	Thailand
Prosper Yonghachea	Schultze-Kraft / Hoffmann	Farmers' perceptions of <i>Imperata cylindrica</i> and <i>Chromolaena odorata</i> fallows in the North West Province of Cameroon	Cameroon
Daniel Diehl	Martin	Charakterisierung der oberirdischen Biomasse einer Agroforstfläche in Leyte, Philippinen	Philippines
Claudia Conzelmann	Biesalski	Contribution of exclusive breastfeeding to iron-status of mothers and infants at 4 months after birth in the Bale mountains, Ethiopia	Ethiopia
Pham Hoa	Valle Zárate	Phenotypic and biometric characterisation of autochthonous Vietnamese Ban pigs	Viet Nam
Isabel Jaffe Lopez	Doppler	Factors affecting income and income distribution of coffee growers in Falcón State, Venezuela	Venezuela
Oghaiki Asaah Ndambi	Hoffmann / Valle Zárate	Perspectives of dairy production in the western highlands of Cameroon	Cameroon
Total Support 2004 (€)			44 371.65

Name	Supervisor	Topic	Country
Christopher Ngosong	Fangmeier	Petroleum refining and coastal pollution in cameroon. case study: The National Oil Refinery (SONARA) and the Limbe Atlantic Coast	Cameroon
Adnan Adeel	Heidhues	Rural poverty analysis in the punjab province, Pakistan: A household survey	Pakistan
John Kobina Anodam	Buchenrieder / Heidhues	Community based participatory micro-credit delivery towards innovative and sustainable micro-credit management - A case study in northern Ghana"	Ghana
Quoc Hoang Dinh	Valle Zárate	The damage of avian influenza on farm household economics in northern Viet Nam	Viet Nam
Semachew Kassahun	Qaim	Constraints and their Impacts on farm incomes in Western Amhara Region, Ethiopia	Ethiopia
Gbenga Mathew Owotoki	Heidhues	Gender differences in household resource and time allocation and its impact on food security: A case study on North Central Nigeria	Nigeria
Christine Yonushonis	Martin	Control of <i>Coponomorpha sinensis</i> Bradley (Lepidoptera: Gracillariidae) in Lychee in the mountainous regions of northern Thailand	Thailand
Marcus Constant Nagle	Müller / Carle	Evaluation of yield and fruit quality of mango (<i>Mangifera indica L.</i>) grown under partial rootzone drying in comparison to other irrigation practices in northern Thailand	Thailand
Martha Laura Frank	Focken	Environmental impact of conventional and organic shrimp pond effluents on the Guaraíra Lagoon: A Case study at Tibau do Sul, Brazil	Brazil
Mireille Hönicke	Qaim / Heidhues	The role of indigenous vegetables for micronutrient consumption in southeast Asia	Taiwan
Marion Hüttner	Mackenstedt	Genetische Untersuchungen an <i>Echinococcus granulosus</i> - Isolaten aus Wildtieren, mit Schwerpunkt Löwen (<i>Panthera leo</i>) des Queen Elizabeth National Park	Uganda
Hagen Lamparter	Buchenauer	Integrated pest and disease control measures in irrigated tomatoes at lake Zwai, Ethiopia	Ethiopia
Kristina Krumbein	Biesalski	Improving the management of malnourished children during the rehabilitation phase -admitted in the Nutrition Unit (NU) of Kumi Hospital, Uganda- Milk-based diet (F-100) versus ready-to-use therapeutic food (RUTF)	Uganda
Marc Cotter	Göltenboth / Martin	Comparison of Abaca (<i>Musa textilis</i>) growth performance in two multi-strata trials with special reference to fiber yield and surrounding vegetation	Philippines
Silke Fanta	Martin / Hilbig	Vergleichende Untersuchungen zur Arthropodenfauna in insektizidbehandelten und unbehandelten Reisfeldern unter besonderer Berücksichtigung der Bedeutung der Spinnen als natürliche Feinde	Philippines

Annex 4

Name	Supervisor	Topic	Country
John Herrmann	Steidle / Martin	Untersuchungen zur Bedeutung von <i>Leea guineensis</i> (<i>Leecaceae</i>) für die Diversität blütenbesuchender Arthropoden-Gemeinschaften auf Degradierten Flächen der Insel Leyte, Philippinen	Philippines
Armin Reinert	Martin	Vergleichende ökologische Untersuchungen an ausgewählten Pionierbaumarten im Hinblick auf ihre Bedeutung für Maßnahmen der Landrehabilitierung auf Leyte, Philippinen	Philippines
Ingrid Maisenbacher	Schultze-Kraft	Einfluss von Wiederaufforstung mit <i>Erythrina poeppigiana</i> (bucare) auf die Waldregenerierung im Bundesstaat Sucre, Venezuela	Venezuela
Total Support 2005 (€)			31 537.78