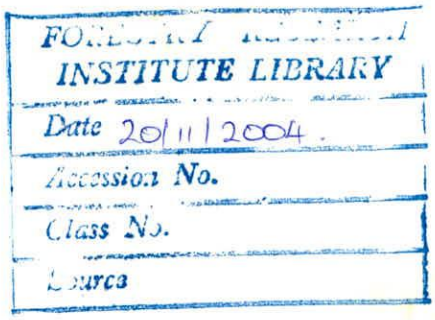


Expressions of Interest

Uganda – Denmark Research collaboration

within

Agriculture & Development

February 2004

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Expression of interest on Uganda-Denmark research collaboration No.1
Danish Institute for International Studies, Department of Development Research (DIIS) (www.diis.dk) ARD cooperation interests in Uganda.

'Farmers' empowerment and outreach of agricultural service provision'

The PMA emphasises empowerment of poor farmers as its contribution to Uganda's poverty reduction strategy. Among the NAADS principles is: "empowering the farmers in agricultural advisory processes and building demand for both research and agricultural advisory services". However, no specific measures seem to include the poor in the processes of commercialisation and technology development, nor to specifically ensure the poor's access to services provided.

As a strategy, PMA does through its NAADS and NARS "pillar"s emphasise innovative methodologies to raise farmer demands for, and use of research and advisory services, such as participatory planning and needs assessment, farmer field schools, farmer – researcher links etc. However research is needed into the processes through which farmers, including the poor and the women, can build and/or control their own institutions, and how these, such as eg. the Farmer Fora are able to ensure that the private sector service providers employ such methods and reach out to the poorer as well as female sections of rural communities.

DIIS together with Faculty of Agriculture, Makerere, has already built up a capacity to carry out poverty and gender analyses within ARD, eg. in gender and poverty monitoring for the DANIDA financed ASPS and in research on poverty reduction, civil society, farmer innovation and agricultural service provision in Kabale, Adjumani and Soroti districts.

Ongoing and future research interests in this field can be divided into four main foci, i.e. agricultural research and advisory service provision reforms as vehicles for poverty reduction, entailing:

a) poverty and gender analysis;

b) farmers' empowerment;

c) institutional analysis of civil society (in a broad sense) and the state;

d) analyses of extension methodologies and service providers, as well as results in terms of agricultural technology development among poor male and female farmers.

Expression of interest on Uganda-Denmark research collaboration No.2
Danish Institute for International Studies, Department of Development Research (DIIS) (www.diis.dk) ARD cooperation interests in Uganda.

'Agricultural markets, technologies, and poverty'

In Uganda, as in many other African countries, the commercialisation of agriculture is widely perceived as the most important driver of economic and technological development, thus eradicating rural poverty. Enhancing smallholder access to and participation in profitable commodity markets has therefore been among the most important development strategies since Uganda liberalised its agricultural markets in the mid 1990s, including the PMA.

Experience suggests that if the efforts to commercialise agriculture in Uganda are to succeed and to result in increased farm productivity and improved livelihoods, it is important to pay attention to both farm/household and market level constraints, and in particular to the inter-linkages between poor farmers' market engagement and their adoption of technologies that improve quality and reduce the cost of production. Research in this field should, in the context of poverty analysis study:

a) constraints at the farm and market levels for poor farmers (male and female) engagement in commodity markets;

b) the impact of different forms of market engagement on incomes and poverty;

c) household and area-based factors linking market engagement and technology adoption;

d) policies and programmes to improve market access for poor farmers and to promote positive dynamics between market participation, technology development, and incomes.

Expression of interest on Uganda-Denmark research collaboration No.3

Collaboration between the research school SOAR and Ugandan researchers:

'Organic agriculture and food systems'

SOAR welcomes the opportunity to suggest collaboration between the research school and individual Ugandan researchers. SOAR offers the unique environment of a multidisciplinary research school that encompasses universities, research institutions, and industries. Within this environment, students receive specialized courses on sustainability in a broad sense and more specialized courses that related to their research topics within the production and food chain. This is supported by a specialized and experienced group of senior researchers and professors with international experience.

Background

The Royal Veterinary and Agricultural University (KVL) in Copenhagen (www.kvl.dk) has with effect from June 2001 founded a research school for Ph.D.-students in organic agriculture and food systems (SOAR; www.soar.dk). This was done in collaboration with The Danish Research Centre for Organic Farming (DARCOF; www.darcof.dk) and the Danish Research Training Council (www.forsk.dk/eng/fur/index.htm). .

A major goal for SOAR is to raise the scientific level of research within areas relevant to sustainable and organic agriculture by training the Ph.D. students to deal with complex problems.

SOAR activities:

- Finance and allocate Ph.D. stipends for research projects within sustainable agriculture and food production
- Conduct two yearly seminars for discussions on progress in the Ph.D. study
- Organize yearly Ph.D. courses one week's duration on sustainable agriculture
- A well-established secretariat assisting and offering advice to Ph.D. students/ info on available courses nationally and internationally
- Organize pedagogical training of supervisors
- Organize guest professorships and short term ad hoc courses on specific research areas
- Supply network for Ph.D. students with interest in sustainable agriculture
- Supply network for supervisors

International cooperation

SOAR aims to strengthen international cooperation both in terms of student exchange and courses in sustainable agriculture and in particular in organic agriculture and food systems. Today this collaboration takes place in a number of ways, including allocation of international stipends, invitation of guest professors, and organisation of international courses.

Ph.D. students that undergo training within the ASPS programme and Makerere University could greatly benefit from an affiliation with an appropriate international research school.

Further, with support from SOAR, scientists who are not directly involved in research in organic agriculture and food systems or sustainable agriculture can be engaged in supervision of students by the support from a team of renowned and international experienced senior researchers, who have a in-depth understanding of the ideas and technologies behind organic and sustainable agriculture. **Contact:** Head of SOAR Henning Høgh Jensen (hhj@kvl.dk) or academic assistant Sofie Kobayashi (sok@kvl.dk) for organizational and financial possibilities.

Expression of interest on Uganda-Denmark research collaboration No.4
Collaboration between the research programme PIMASA and Ugandan researchers on

'Crop-livestock interactions'

PIMASA (www.pimasa.kvl.dk) welcomes the opportunity to suggest collaboration between the research programme and individual Ugandan researchers on crop-livestock interactions. PIMASA work on integrating grain legumes in the maize-based cropping systems of eastern and southern Africa. The main focus has been on introducing modern varieties of pigeonpea (*Cajanus cajan*) in Tanzania and Malawi. In this work, crop-livestock has emerged as area than needs much more attentions as pigeonpea integration has been found to strengthen the crop production, the amount of fodder available during the dry season and thus livestock performance, as well as manure quantities. PIMASA would like to establish contacts with Ugandan colleagues with interests within this area.

Background
Pigeonpea is an important grain legume crop for human nutrition and livestock fodder and its stem is useful firewood. Pigeonpea is ideal for intercropping with maize due to their complementary use of resources and because pigeonpea thrives on soils with low availability of soil phosphorus and water.

A strategic incorporation of pigeonpea varieties into the cropping system will add nitrogen to the plant-soil system via symbiotic N_2-fixation and thus improve nitrogen supply and crop production. Subsequently, increasing inputs of organic residues (shedded leaves, stalks, roots) and their turnover in the soil lead to higher availability of soil nitrogen, which is a prerequisite for sustainable agriculture.

Successful integration of pigeonpea into maize based cropping systems has been found to take place when appropriate seeds are available. The local, regional, and global markets for pigeonpea grain are unsaturated. Further, several cases from Tanzania demonstrate that communities establish local mechanisms that control both the pastoralists' and agriculturalists' interests.

The research team consists of researchers from:
- The Royal Veterinary and Agricultural University in Copenhagen (KVL)
- Danish Institute for International Studies (DIIS)
- NARS-Malawi, Chitedze Agricultural Research Station, Lilongwe, Malawi.
- NARS-Tanzania, Ilonga Agricultural Research Institute, Morogoro, Tanzania
- Ghana University

Further, individual researchers from ICRISAT are associated to the research programme.

Collaboration
The crop-livestock interactions have emerged as one out of three focus areas that needs further investigations. The PIMASA team are seeking new funds for continuing this work.

We hold the view that improvements in livestock productions must to a large extent be based on improvements in terms of quantity but also in quality of the available fodder during the dry season. For most small holders, this is only possible by increasing the availability of plant residues. Can this however be increased the is a positive feedback effect on livestock performance and manure production back to the soil fertility and crop production.
Contact: Coordinator of PIMASA Henning Høgh Jensen (hhj@kvl.dk).

Expression of interest on Uganda-Denmark research collaboration No.5
DIAS, KVL and Risø

'Assesing the environmental consequences of transgenetic plants - Developing biosafety procedures'

Background
Uganda is one of the few African countries with existing biosafety legislation and the country is actively pursuing plant biotechnology. Biosafety aspects of transgenic plants are very important. Several donors are active in building up biotechnology capacity (USAid, Sweden's Bio-earn project) but biosafety capacity building has not been the main emphasis of these programs. It is of utmost importance for biosafety and international trade that African countries adopting biotechnology have not only legislation and policy measures in place, but also appropriate biological databases, biosafety procedures and personnel who are well versed in the actual tests to be done and can perform and evaluate them. This will also be required by the legislation. The main commercial partners of these countries are European who are sceptical about transgenic plants. Consequently, it is very important that a professional, independent and transparent GM-biosafety procedure is in place - otherwise there are serious trade risks for these countries.

Aims:
Our suggestion is to build up GM-biosafety testing capacity in Uganda, building on previous experience by

- building up a *biological database* of potential non-target organisms
- *developing* and *adapting* appropriate *experimental procedures* for pre-release testing of GM plants. As a starting point, tests suggested by the IOBC GMO Guidelines project, the Swedish-funded Bio-earn project and the relevant Danish-funded projects are tried and adopted as needed to Ugandan conditions
- to *train* scientists, students and technicians (this latter is especially important) in *performing biosafety tests*. These activities should concentrate on training *locally*.

Outcome:
As the main outcome of the suggested work, detailed protocols for experimental biosafety assessments are developed and tried out, and database, procedures and personnel are available for a National Biosafety Laboratory. An effective and transparent decision path is in place for informed decisions about the potential adoption of transgenic plants for field growing in Uganda.

Research competences:

- ***Danish Institute of Agricultural Sciences, Department of Crop Protection***

G. Lovei - ecology & ecological consequences on beneficial organisms, beneficial ecological mechanisms (biological control, pollination, soil fertility), and biodiversity.
K.H. Madsen - management GM crops, weeds & weed resistence

- ***KVL Centre for Risk Assessment***

P.Sandøe - ethical and legal aspects of GM organisms

- ***Risø National Laboratories***

T. Hauser - gene flow and gene containment, plant ecology

Through our profound involvement in European and international research projects and initiatives, we can also draw on a wide European research network for additional expertise as necessary to reach the aims mentioned in this Expression of Interest.

Contact: Gabor.Lovei@agrsci.dk

Expression of interest on Uganda-Denmark research collaboration No.6
Proposal for research collaboration between the Agricultural sector in Uganda and Department of Agricultural Science, KVL, Denmark

'Integrated crop production - On-farm research'

A well functioning link between research, extension and farmers is important for agricultural development. In recent years various technologies and procedures have been developed to improve farmers' participation in research. The Danish agriculture has a long tradition in on-farm research. Thus in 2003 more than 1400 on-farm experiments were carried out on Danish farms, evaluated and published at the end of 2003.

The purpose of the collaboration would be to enhance the capacity of scientists to carry out on-farm research together with Agricultural University, Research and Extension Institutions through onfarm research programmes.

The main activity being research based manpower development in methods and techniques at researcher, extension-staff and university student level. Research will be based on on-farm studies and including topics as
- Variety evaluation and seed production,
- Improved crop rotation systems and weed management
- Soil management for improved productivity in rain fed farming.

The research and training programmes will emphasise on particular points relevant for on-farm research regarding:
- Experimental design
- Trial Management
- Data collection and treatment
- Data interpretation
- Fast and efficient disseminations of results

The research will be partly implemented through medium and long term training programmes involvingMSc and PhD sandwich programmes. The expertise of Danish Agricultural Advisory Service,(www.lr.dk) responsible for the Danish on-farm experiments, will be an integral part of the programme.

Genetic resources –plant breeding – exploitation of local resources
Large genetic variation still remains among landraces in developing countries. The conservation and utilization of these genetic resources are of outmost importance. Results from many areas show that close collaboration between plant breeding and genetic resources programmes can lead to fast on-farm improvement. For Uganda the introduction of new varieties of pigeonpea varieties in the sorghum belt based on selection of African landraces is an example. Research programmes would include characterization of germplasm including valuable agronomic traits such as: yield, quality, resistances to pests and diseases, agro-ecological adaptation. Evaluation under realistic on-farm conditions would be an important parameter.

The main activity will be research based manpower development in methods and techniques at researcher, extension-staff and university student level.
- Advance statistical analyses of variation
- Use of molecular techniques in germplasm characterization
- Exploitation of indigenous knowledge

- Fast identification of valuable traits for breeding programmes
- Scientific basis for developing core collections for rational utilization
- Dissemination of results through databases and publications

Research programmes will partly be implemented through medium and long term training programmes involving MSc and PhD sandwich programmes, and may be implemented in collaboration with the Nordic Gene Bank (www.ngb.se).

Seed quality –formal sector – informal sector
The formal seed sector in developing countries including intellectual property rights and trade regulations is in the process of adopting the format of developing countries. However, the major quantity of seed will in a foreseeable future still be produced in the informal sector. Thus both sectors should be simultaneous stimulated. For the formal sector research is needed to develop morphological and molecular based technologies to determining variety identity. Particularly for locally important species assessment based on morphological characters may need development in connection with DUS and VCU testing. There is a lack of knowledge on seed quality in the informal sector. Establishment of the relative importance of technical and genetic seed quality and the role of farmers procedures during production and storage is needed to develop valid extension messages.

The main activity will be research based manpower development in methods and techniques at researcher, extension-staff and university student level with emphasise on:.
- Molecular and morphological techniques for variety identification
- Factors affecting genetic quality of on-farm produced seed
- Factors affecting technical quality of on-farm produced seed

The research programme will partly implemented through medium and long term training programmes involving MSc and PhD sandwich programmes

Seed – chain - development
KVL is together with a number of other Danish key institutions and companies within the seed industry partner in a Seed Science and Technology Centre. The centre offers various research and training opportunities for the whole seed chain from genetic resources, breeding, seed production, seed processing and quality control to management and seed trade.

The main activity will be research based manpower development in methods and techniques at researcher, extension-staff and university student level.

For the Department of Agricultural Sciences particular interest within the Seed Science and Technology Centre would be medium and long term training and research programmes for future cadre personnel in the public and private seed industry. Programmes can be individually tailor-made and would include
- Management of genetic resources
- Plant breeding technologies and management.
- Seed Production management
- Seed Technology

Programmes under the seed centre will be implemented in collaboration with other Danish Institutions and private companies and be implemented through medium and long term training programmes involving MSc and PhD sandwich programmes.
Contacts: Jørgen L. Christiansen (jlc@kvl.dk) and Jens C. Streibig (jcs@kvl.dk)

Expression of interest on Uganda-Denmark research collaboration No.7

Risø National Laboratoriums: Thure Hauser[1] and Ahmed Jahoor, Plant Research Department, Risø National Laboratory, Box 49, DK-4000 Roskilde, Denmark. [1]thure.hauser@risoe.dk ;Tlf: +45 4677 4238; Fax: +45 4677 4160.

'Use of genetic resources for crop improvement'

Background and goal

Among the most important goals of crop improvement is the continuous renewal of resistances against diseases and environmental stresses. Genetic resistance is the economically and environmentally most sustainable way to control diseases and stress. However, the restricted availability of new resistance genes in the gene pool of cultivated crop plants, and a rapid development of pathogens to overcome existing plant resistances, forces breeders to look for new and effective resistance genes in wild relatives and exotic material. New sources of resistance are often found in wild relatives, e.g. at the center of origin of the crop plants. The transfer of resistance genes into breeding lines and cultivars has become much faster and more feasible by the use of DNA marker technologies.

The goal of our project is to identify important disease and stress resistances in wild relatives of cultivated crop plants in Uganda, characterize them, and transfer the traits to local and regional gene pools. The results will additionally be used to suggest utilization and management plans for genetic resources, and to evaluate effects of outcrossing between genetically modified crop plants and wild relatives in the region.

The project will be carried out in close cooperation with national partners at agricultural research centers and universities, with strong emphasis on educational aspects. The project will thus include PhD. stipends and on-the-site training of students, scientists, and breeders.

Danish participants

Thure Hauser, Ph.D., Senior Scientist, (http://www.risoe.dk/pbk/staff_uk/thha.htm)
Specialised in population biology, population genetics, and evolution. Has studied hybridization between crops and wild species for a number of years..

Ahmed Jahoor, Ph.D., Senior Scientist, (http://www.risoe.dk/pbk/staff_uk/ahja.htm)
Specialized in plant genetics and breeding, especially disease resistance. Has extensive experience in utilization of genetic resources from wild plants for disease resistance

Expression of interest on Uganda-Denmark research collaboration No.8
Forest & Landscape Denmark.

Some Research/Cooperation Areas to the Ugandan-Danish ASPS2 Programme. The Danish supported Agricultural Sector Programme Support (ASPS) to Uganda opens op for EoI and exploration of potential and ongoing research programmes related to the Agricultural sector in brief. This is a list of potential areas in where S&L, Denmark, offer its co-operation services:

Agricultural Environment
Environmental Protection. Selection of acceptable tree species for erosion reduction. Species zones: Identification and availability of suitable tree species for particular agri-ecological zones.

Gene conservation
Conservation of forest and trees' genetic resources. Identification, collection, propagation, evaluation and utilisation of important and valuable tree species. Homepage for further information: http://www.sl.kvl.dk/Emner/Internationalt/ManagementandConservation.aspx

Agroforestry
Improve soils and control soil erosion. Test of alternative agroforestry species trees for soil improvement, incl. selected local species and fruit trees.

Yield
Yield and soil-fertility improvement of agroforestry trees. Breeding of improved varieties.

Improved Seed supply
Improved seed supply of high quality seed to tree planting farmers in Uganda.

Trees on farm
Introducing more trees on farm to increase crop yield, soil fertility, counteract erosion, and stabilise the environment

Promoting Underutilised Tree Species
Introduction and testing of underutilised tree species with identified potential. Obtain knowledge on propagation. Breeding strategies.

New products
Explore and possibly safeguard the market potential of new tree introductions and products.

Post Harvest Handling
Techniques of maintaining storability, viability and vigour upon seed collections in field. Time reduction techniques and proper grain and seed handling before storage. Low cost temporary storage techniques.

Expression of interest on Uganda-Denmark research collaboration No.9
DIAS, Flakkebjerg

'Analysis of pesticide residues in food and in the environment'

Background
Misuse of pesticides is a reality in many tropical farming systems, especially in peri-urban areas. Pesticide residues on food are a threat to consumers' health, as well as an obstacle to export. The EU for example has very strict Maximum Residue Limits.
Furthermore, pesticide misuse creates environmental problems, polluting soil and water.

Research competences

Danish Institute of Agricultural Sciences, Department of Crop Protection

Our compentences cover all aspects of pesticide chemistry:

We have a very well-equipped laboratory and many years experience in analytical chemistry applied to pesticide residues in food, soil and water. We have performed fate studies of pesticides in the environment, studies comprising degradation in soil as well as leaching to surface waters and subterranean waters. Risk assessment applied both the occurrence of pesticides in food, in the environment and in the working environment is performed with the integration of fate and exposure models.

We have given a number of training courses in our laboratory both at beginners and advanced level and we have experience in the building up of analytical facilities in developing countries as well.

More information:

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http://www.agrsci.dk/plb/ifo/index_uk.shtml; http://www.fateallchem.dk

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Expression of interest on Uganda-Denmark research collaboration No. 10
DIAS, Flakkebjerg and KVL

'Weed control under tropical small-holder conditions'

Background

Weeds are a major constraint to crop production competing with the crop for nutrients, water, space and light causing loss and lower quality of the harvested produce. In Uganda the most common method of weed control is hand weeding; a tedious and time-consuming method that relies on ample supply of labour. As a result weeding is often not done timely and thus causing unnecessary crop losses. Chemical weed control offers an attractive alternative to hand weeding in some situations and enables farmers to control weeds before they have harmed the crop. Herbicides fits well into integrated weed management strategies and a judicious use of herbicides offers a potential to secure and possibly increase crop production in Uganda without causing unacceptable risks to human health and the environment. A prerequisite is that herbicides are tested routinely by using appropriate protocols and by properly trained personnel, who know the benefits and side effects of the chemicals. The efficacy testing at NARS institutes should be rapidly disseminated to extension and on-farm researchers before being introduced to practice to establish the optimum use of the herbicides and thereby maximise the benefits to farmers.

Research competences

Danish Institute of Agricultural Sciences, Department of Crop Protection
The Department of Crop Protection is the leading Danish authority on chemical and non-chemical weed control in crop production. The department has a long track record on applied research on the correct and optimum use of herbicides and non-chemical weed control methods as well as the use of preventive methods such as competitive varieties. The department is responsible for the efficacy evaluation of herbicides submitted for registration to the Danish Environmental Protection Agency. Weed scientists from the department were strongly involved in the Integrated Pest Management Component of the Agricultural Sector Support Programme in Eritrea assisting in introducing novel chemical and non-chemical control methods.

Royal Veterinary and Agricultural University (KVL), Copenhagen, Denmark
The Department of Agricultural Sciences, KVL, offers research-based education in weed and crop science at the Master and Ph.D. levels. The Weed Science group has experience in educating MSc. students from various parts of the world. Recently we graduated MSc. students from Eritrea and Palestine and currently we have Ph.D. students from Iran. The Weed Science Group at KVL is engaged in many aspects relevant to tropical crop protection, e.g.,

- Weed biology and ecology
- Population dynamics of weeds and influence of management practices on weed composition
- Competition between weeds and crops
- Herbicide selectivity and ecotoxicology
- Herbicide resistant crops and weeds
- Environmental aspects of weed control
- Parasitic weeds of the tropics

Contact Person: Per Kudsk, Danish Institute of Agricultural Sciences, Research Centre Flakkebjerg, Department of Crop Protection. Email: Per.Kudsk@agrsci.dk

Expression of interest on Uganda-Denmark research collaboration No.11
DIAS, Flakkebjerg

'Safe use of pesticides'

Background

Misuse of pesticides is a reality in many tropical farming systems, especially in cash crops and in peri-urban areas, and this poses a serious health risk to the farmer applying pesticides. Misuse can also lead to overdosing and may lead to high pesticide residues in the crop. It also constitutes a risk to the environment.

Despite many efforts to make farmers aware of the health risks of using pesticides and despite many attempts to train farmers in minimizing the health risks, improvements have been very slow.

The reason may well be that many of the recommendations given of how to protect one-self are not appropriate, e.g. the protective clothing recommended is too heavy or warm in a tropical climate or are too expensive for poor farmers.

It seems clear that most of the publications on safe use of pesticides in developing countries do not take the right starting point when approaching the problems, and do not take into account three points that are essential for farmers' protection against pesticides:

- Where is the body most exposed to pesticides?
- How much are the different parts of the body exposed.
- Which spraying scenarios are most dangerous to the farmer?

Only when farmers, through very practical demonstrations, have understood the risks they become motivated to protect themselves.

Research competences

Danish Institute of Agricultural Sciences, Department of Crop Protection

Scientists at the Department of Crop Protection, Danish Institute of Agricultural Sciences, have visualised the mentioned points for Danish farmers by means of pictures and in real experiments. Only thereby one has succeeded to convince farmers to use Personal Protective Equipment (PPE) when working with pesticides in agriculture, and to convince farmers that protection equipment is only a part of the protection which includes also the way farmers apply pesticides, working attitudes, and how to take care.

The Department of Crop Protection has a long experience in pesticide efficacy testing. Further, the department is responsible – on behalf of the Danish Environmental Protection Agency – for the administration of the Danish GEP (Good Experimental Practice) approval system. GEP is implemented in order to assure a high quality in field experimentation. Both above mentioned activities give a good background to offer training and courses in field experimentation with pesticides. This is further strengthened by the fact that the department is involved in application technical aspects relating to efficacy and spray drift.

Contact: Senior Scientist Peter Kryger Jensen (PeterK.Jensen@agrsci.dk)

Expression of interest on Uganda-Denmark research collaboration No.12
DIAS, Flakkebjerg

'Plant virology and bacteriology'

Background

Virus diseases are known to be widespread in many tropical crops. However, because of lack of specialists, they often remain unnoticed.

Virus and bacterial diseases cannot be controlled by pesticides. In stead, prevention strategies, such as production of healthy propagation material, as well as cultural methods and use of plant resistance have to be employed.

Research competences at the Danish Institute of Agricultural Sciences, Department of Crop Protection

The Danish Institute of Agricultural Sciences, Department of Crop Protection has many years of experience in applied research in plant virology and bacteriology.

Methods
The department has competence in methods of classic virology and bacteriology, serology, RNA/DNA extraction, different kinds of PCR, gene sequencing and use of probes. In bacteriology furthermore fatty acid analysis.

Programmes for production of healthy propagation material
The department has been involved in establishing nuclear stock programmes to secure delivery of pathogen and pest free mother plants of vegetatively propagated crops, such as potato and many ornamentals. This has included testing for a long range of viruses and bacteria.

Research areas
Research in applied plant virology in general with specially emphasis on soil borne viruses, especially viruses with Plasmodiphorale vectors and potato viruses.

Research collaboration with developing countries
The research group has recently been involved in elaborating research project applications with developing countries. As examples can be mentioned: "Identification of important seed borne viruses in soybean in North Vietnam and control methods" in cooperation with Hanoi Agricultural University and National Institute of Plant Protection; "Emerging Serious Virus Diseases of Sunflower in Tanzania: Etiology and Epidemiology of Sunflower Rugose Mosaic and Yellow Ringspot Virus Complex – Contribution to Management" in cooperation with Sokoine University of Agriculture and "Implementing Integrated Pest Management in Vegetables in Mozambique" in cooperation with University Eduardo Mondlane.

Contact: Research leader Steen Lykke Nielsen, SteenL.Nielsen@agrsci.dk

Expression of interest on Uganda-Denmark research collaboration No.13

Section for Plant Pathology , Department of Plant Biology, KVL

'Seed'

The Section for Plant Pathology is responsible for carrying out research, training and teaching at all levels in the field of plant pathology and as such has a unique function in the Danish research and education system. Research in the section addresses the fundamental nature of problems in plant production caused by pathogenic microorganisms including fungi, Oomycetes, bacteria and viruses.

Our priorities are (1) the nature of disease resistance against all forms of plant pathogen, (2) the infection pathways used by fungi, (3) the population dynamics of crop pathogens and their ecology. Priority is also given to (4) the ecology of biological control organisms and their interactions with pathogens as well as to plant-pathogen interactions. These studies implement a number of diverse technologies, and require that we develop new methods.

Molecular biological techniques are used in several branches of our research activities, namely (1) studies of the nature of defence responses, (2) the preparation of constructs for making transgenic plants and microorganisms and for transient expression studies, in (3) studies of biocontrol agents and pathogens and as (4) markers and/or reporter technology for genetic, ecological and taxonomic studies. State of the art microscopy techniques applied in the projects include the use of light, fluorescence microscopy, laser confocal microscopy (including two-photon) as well as both transmission and scanning electron microscopy.

The scientific knowledge obtained is applied in several ways: for instance as ecological data in the development of biological control strategies for controlling seed, soil-borne and foliage pathogens, the development of transgenic disease resistant plants, and the development of resistance based control strategies. We have a long research tradition and the subjects for our studies are taken both from temperate and tropical agricultural systems. Our results find application in conventional (including integrated pest management) and organic growing systems.

Since 1/1-04, the former Danish Government Institute for Seed Pathology for Developing Countries has been integrated into the section for Plant Pathology.

Expression of interest on Uganda-Denmark research collaboration No. 14

DIIS – Danish Institute for International Studies, Department of Development Research, Denmark (www.diis.dk), Esbern Friis Hansen
KVL – The Royal Veterinary and Agricultural University, Department of Plant Biology, Denmark (www.plbio.kvl.dk), Solveig Danielsen
WUR – Wageningen University and Research Centre, Department of Technology and Agrarian Development, The Netherlands (www.sls.wau.nl/tad), Conny Almekinders

'Seed Systems Research – Understanding the Farmers' Need for Seed'

Sustainable provision of seed of appropriate genetic and physiological quality to resource-poor farmers remains a serious constraint to rural development in many developing countries. Many new crop technologies are embedded in the seed of improved varieties and can only be made available to the farmers if efficient seed supply chains exist. Many seed projects targeting the poorest have failed partially because existing seed systems do not consider the complexity of livelihood and risks, and because the underlying assumptions, i.e that farmers are willing to buy higher quality, healthier seeds once they become aware of the benefits, may not always be correct.To better understand the decision-making processes of farmers regarding choice of seed source, we suggest a more in-depth study of farmers' demand for seed, their perceptions of quality, costs/price, risk, benefits and actual performance of improved seed, including analyses of past or on-going seed 'enterprise' initiatives.

Proposed research questions

1. What are farmers' cost/benefit calculations in relation to seed?
This in the widest sense, involving labour availability and marginal costs, risk, transaction costs, perceptions, performance of seed in the farmers' fields. It is of relevance to seed quality, introduction of new varieties, the basis of small enterprise development, etc.

2. How much better should the seed be for farmers to be attractive?
Quality Declared Seed standards offer an alternative to more general rigorous standards. Is this a viable alternative or are the QDS standards still too high? How to develop appropriate, trustworthy quality standards for specific growth conditions and crops? Varieties are often bought in small quantities; the real bottleneck/challenge is to get programs going that in economically sustainable way can provide quality seed.

3. How does 'good seed' perform in farmers' conditions?
Very few and poor data are available on this. Current perceptions about the performance of seed of varying quality are often based on assumptions and field trials conducted under controlled *ex-situ* conditions.

These areas of study are naturally interlinked and through conceptualisation of the generated knowledge and information (over countries, crops, etc) foundations will be provided to the development of sustainable seed provision systems in different development contexts.

Possible partner institutions in Uganda:
Makerere University
NARO

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Senior Scientist Esbern Friis Hansen (DIIS) efh@diis.dk

Expression of interest on Uganda-Denmark research collaboration No. 15

EoI for joint research between KVL, Makerere University and possibly other Ugandan institutions and institutions within the Danish Network for Agricultural Research for Development (NETARD).

'Chemical contamination of drinking water resources from cassava growth and processing – problems and solutions.'

Biotoxins are the cause of poisoning of animals and man resulting in large economic loses and lowering of health. Mycotoxins such as aflatoxins and phytotoxins as e.g. cyanogenic glucosides are well known examples. Biotoxins are ingested with food/feed and contaminated water. Ames and Profet (1992) estimated that 99 % of human exposure to toxins is due to biotoxins. Exposure seems to be particular severe in tropical areas due to less regulation of toxic food plants and preference by subsidiary farmers for highly toxic cultivars in order to reduce loss. Hitherto, most concern has been devoted to human exposure of biotoxins through food. However, very recent research at KVL has demonstrated that biotoxins such as the highly toxic and carcinogenic glucoside ptaquiloside added to soils through exudates from plants/leaching from decaying plant debris may leach to surface and groundwater, impairing the quality of the water resources (Rasmussen et al., 2003). Hence, also other glucosidic biotoxins such as e.g. the cyanogenic glucosides present in Cassava (*Manihot esculenta*) and their toxic degradation products must be under suspicion as serious contaminants of water supplies as further described below. Both ptaquiloside and the group of cyanogenic glucosides are very much more toxic than most of the pesticides that often leads to great health risk concerns.

Cassava is, with an estimated world production of 180,076,541 Mt in the year 2002 (FAO, 2003) among the major food crops in the world. The root is an indispensable source of starch and the leaves are used for other purposes (Bokanga, 1994; Padmaja, 1995). In sub-Saharan Africa cassava is of major and growing importance. Thus the production raised from 70,000,000 to 100,000,000 Mt in the period 1990 to 2002. In Uganda the production has raised dramatically after the African Cassava Mosaic Virus Disease epidemic in the years 1988 and forwards, i.e. from estimated 2,896,000 MT (1992) to 5,300,000 MT in 2002 (FAO, 2003).

Upon plant decay, processing as well as eating the cyanogenic glucosides degrade to release the very poisonous compound hydrogen cyanide. Thus, particularly the international network of agricultural research stations under the CGIAR organization, notably IITA and CIAT have been breeding not only for resistance to a number of pests but also for a low content of these inherent biotoxins. Nevertheless, many farmers - in Africa and elsewhere - still breed very highly toxic cultivars (Nweke, 1992; Chiwona-Karltun *et al.*, 1998), a tendency that even seem to strengthen in some geographical areas. Such cultivars may release up to around 650 mg of hydrogen cyanide per kg fresh weight from the edible part of the root tuber, the root peel and the green plant-parts being up to 5 times as toxic (Saka *et al.*,1998a). These cannot be eaten without processing to detoxify the roots, processes that often include soaking in ponds, fermentation and de-watering (Padmaja, 1995; Brimer, 2001). During such processes water is produced that may contain high concentrations of cyanogenic glucosides and their toxic degradation products (Brimer, 2001). Unacceptable levels of cyanide in drinking water may be found in the recommendations by WHO which sets a limit of 0.07mg/litre for cyanide (WHO, 1996/1998), the Danish legal regulation stating a limit of 0.05 mg/litre (Miljø-og Energiministeriet, 2001).

Based on the new knowledge concerning the fate of ptaquiloside and the fact that the cyanogenic glucosides present in cassava are closely related when it comes to the physio-chemical properties, the latter must be anticipated to also be very mobile in a soil matrix. In connection

with the expanding cultivation of highly toxic cassava cultivars in certain communities, it therefore seems most likely, that problems with unacceptable high concentrations of toxic compounds from cassava in water resources may exist under several climatic, geographic and geophysical conditions.

The aim of the proposed project(s) would be to perform a number of basic investigations as well as a preliminary survey at cassava growing research stations and a limited number of farmer communities, in order to clarify:

- The occurrence of cyanogenic toxins and their toxic metabolites in soils, soil-waters, ground water and surface-waters in fields and at other places in connection with the growing and processing of highly cyanogenic cassava clones, as compared to the growing of low-cyanogenic cultivars.
- The degradation of cyanogenic glucosides from cassava in different soils under different climatic conditions
- The bonding of the genuine as well as derived cyanogenic toxins in cassava to different types of soil
- The leaching of the above mentioned compounds from soil and fermentation ponds to surface-waters and groundwater

These investigations would make it possible to quantify the mass balances of cyanogenic glucosides and their toxic metabolites in the cassava growing areas and hence to estimate the risk of human and animal poisoning by these biotoxins transferred via water. From the collected knowledge on the fate of toxins in different soils and in fermentation ponds under different climatic and processing conditions it would furthermore be possible to establish guidelines which reduce the risk of health impairment during cassava growing and processing. The knowledge must be transferred to cassava growing farmers and the local extension officers to reduce risks of pollution with cyanogenic substances and to avoid growing of cassava on sites and under conditions most susceptible to pollution of water resources.

Contacts:

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Toxicology

Hans Christian Bruun Hansen,
Professor,
Environmental Chemistry

Expression of interest on Uganda-Denmark research collaboration No.16
KVL

"Improved livelihood of rural population through improved smallholder livestock production".

Poverty in developing countries is most serious in the rural areas where the majority of the people live. Rural people are peasants who practice subsistence farming as their main activity both to provide food security and cash income. Unfortunately because of the level of investment, neither of the objectives are achieved. Keeping of livestock is quite common in most rural areas.

Even poor families keep chickens and hence promotion of chickens in rural areas will have an impact on even the poorest of the poor. Chickens are subject to a low input, low output type of management. However, as is evident from the chicken smallholder women farmers of Bangladesh, rural chickens could be a serious business from which one could raise the income of the rural people and alleviate poverty, which is the main objective of proposed research.

Unfortunately, under the traditional type of management in which chickens are raised, they cannot be expected to perform well. Morbidity and mortality and other losses are high and can reach above 50%. The most important disease among adult chickens is Newcastle disease which can decimate whole village chicken flocks that are not vaccinated.

A consortium of researchers in Uganda, Tanzania and Denmark, acquainted with each other through ongoing research activities, propose to formulate and test improved health management systems, including vaccination strategies for Newcastle disease prevention, for rural poultry production and to measure the socio-economic impact of such plans. The research should preferably be a component of larger research package dealing with rural poultry production, where other management practises, market access and other important factors are included in the research. The project group is open for such collaboration, and to collaboration with groups in Uganda, which have worked on the characterization of local strain of Newcastle disease virus.

The key researchers of the consortium (each representing large research groups within rural poultry health and production) are Professor Eli Katunguka Rwakishaya, Makerere University, Uganda (Animal Health), Associate Professor Malongo R.S. Mlozi, Sokoine University, Tanzania (Socio-economy), Professor John E. Olsen (Royal Veterinary and Agricultural University, Denmark (Rural poultry health). The practical work will be based on scientists in Uganda, while the Tanzanian and Danish scientist will be active in the formulation of project components and in evaluating results.

All research groups are based within Universities with experience in undergraduate and post graduate training. The research consortium is also open for collaboration with other activities in the form of training of personnel on all levels.

Contact person: Professor Eli Katunguka Rwakishaya, Makerere University, Uganda. E-mail: deanvet@vetmed.mak.ac.ug

Expression of interest on Uganda-Denmark research collaboration No.17
KVL

'Small scale fish farming in African freshwater ponds and lakes'

'Sustainable farming methods in African fish farming'

Danish party: Section of Fish Diseases, Department of Veterinary Microbiology, Royal Veterinary and Agricultural University, Stigbøjlen 4, DK-1870 Frederiksberg C., Denmark

The Research Network and Research School SCOFDA (Sustainable Control of Fish Diseases in Aquaculture)

Contact-person: Kurt Buchmann, research professor and research school leader (e-mail: kub@kvl.dk)

Suggested research areas:

Small scale fish farming in African freshwater ponds and lakes

Sustainable farming methods in African fish farming

Background: The Danish party has been conducting research and teaching (B.Sc., M.Sc., Ph.D. levels) in the fields of both intensive and extensive aquaculture for decades. Both tropical and temperate geographical areas have been treated. It is suggested to initiate collaboration between the Danish party and interested collaborators in Uganda with the specific aims of developing aquacultural activities in Uganda (freshwater fish farming) and develop sustainable methods for health control in the production plants. Previous results have shown that involvement of women (female farmers) in this type of production and research is quite successful.

Suggested initiatives:

1) Establishment of contact between researchers in Uganda and KVL.
2) Definition of specific projects (geographical location, fish species, local host institutions).
3) Connecting local researchers to the Danish Research School and activities.
4) Establishment of pilot-projects in Uganda.

Interested researchers and universities should contact Kurt Buchmann

Expression of interest on Uganda-Denmark research collaboration No.18

Expression of interest on Uganda-Denmark research collaboration
Regarding collaboration between Ugandan universities and Danish universities on Sustainable Land Use and Natural Resource Management (SLUSE).

The Danish SLUSE university consortium welcomes the possibility of a collaboration with Makerere University.

Background
The Danish University Consortium on Sustainable Land Use and Natural Resource Management (DUCED SLUSE) comprises three Danish universities and facilitates education and research on a wide range of topics pertaining to sustainable land use and natural resource management. SLUSE has developed a unique programme for the integration social and natural sciences through problem based reality confronting joint projects including joint field studies. By this initiative improvement of education, field training and research has been achieved in Denmark but most importantly also in the countries targeted for Danish environment and development assistance (the DEA countries). In Africa these countries of SLUSE collaboration currently are South Africa (University of Natal-Pietermaritzburg and University of Durban-Westville), Swaziland (University of Swaziland) and Botswana (University of Botswana).

The current status (primo 2004) of SLUSE is as follows:

- SLUSE is currently in the consolidation phase of the project, and is planned to continue as a self sustaining education alternative for B.Sc.'s in Denmark, Malaysia, Thailand and the southern African countries, also after the end of the current consolidation phase (2006 and onwards).
- The foundation for teaching inter-disciplinary environmental courses has been set up in the three partner universities in Denmark and in the partner consortia in Malaysia, Thailand and southern Africa (MUCED, TUCED and SACUDE SLUSE).
- SLUSE research programs have been set up.
- SLUSE PhD students are currently working within SLUSE.
- Extensive course catalogues have been set up
- Over 300 Danish students have taken or currently attend SLUSE. In Malaysia 100 students have gone or are going through Masters training, and ca. 70% of these were mid-career professionals. The past 2 years have seen an intake of 50-60 students annually in SLUSE curricula in Thailand, and HRD programmes and educational activities are now being established in Botswana, South Africa and Swaziland

Possible collaboration
As of today the countries are as described above, however, the collaboration could sensibly be broadened to also involve east African universities. It would be relevant to seek a linking of such collaboration with the existing SACUDE SLUSE universities.

For more information on DUCED SLUSE, please visit http://www.sluse.dk

Contact
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The Royal Veterinary and Agricultural University
Thorvaldsensvej 40, 1871 Frederiksberg C, Denmark

Expression of interest on Uganda-Denmark research collaboration No.19
KVL and others

'Support to implementation of Experimental Learning and enhancement of capacity to do Outreach Oriented Research at Faculty of Agriculture, Makerere University, Uganda'

The MOP-Group (Methods and Problem Oriented Learning) welcomes the opportunity to suggest collaboration between the MOP-Group and the Faculty of Agriculture at Makerere. The MOP-Group has extensive experience in developing experiential and problem oriented curricula and learning programs at universities and other educational institutions in Denmark and Australia.

Following discussions with Professor Adipala Ekwamu during his visit to Denmark in December 2003, it became clear the Faculty of Agriculture at Makerere was keen to take on the new challenges in education for the future. Changing the curriculum to incorporate the ideas from experiential and problem oriented learning will require a lot from the individual scientist who has to change not only their way of teaching but also to some extent their views on learning. Changes will have to be made also at institutional level. Any such shifts towards more contemporary learning paradigms will require adjustments in administrative procedures; Faculty priorities and staff reward system, if to be successful. At the same time as changes in the teaching system are happening, the whole structure of research funding is, according to Professor Adipala Ekwamu, being modified. As a consequence public research funds will in the future be pooled in competitive funds. Ability to conduct research in close collaboration with other stakeholders in society thus becomes a prerequisite for tapping into these resources. Changes at Makerere seem to be matched by similar changes in the National Agricultural Research Organisation (NARO).

One of the cornerstones behind the success of Danish agriculture has been the ability of the scientists from the Royal Veterinary and Agricultural University (KVL) to work in close collaboration with the farmers, the advisory service and the national research institutions. Such collaboration in research with partners in the wider society calls for extra skills in the scientists. These skills should be developed at university during the years of study. As a consequence, the educational system at KVL is from time to time reformed and revised to best mach the need of the society it serves.

A change at Makerere incorporating concepts of experiential learning in the university curriculum and a focus on more applied research go hand in hand. Positive synergies can be created by attaching students to research activities in the field and by referring classroom theory to ongoing more practical research activities. However, prerequisites for all this to happen will be that there is a conducive environment for change (which according to Professor Adipala Ekwamu seems to be more or less in place) and a wish/will to change by the involved scientists/lectures (unknown at this stage). One approach to capacity development of teaching faculty and institutional development at University level would be to build a small nucleus of dedicated scientists/lecturers as a core group, working with more experienced educators and facilitating the change process from within the institution. The formation of such a group would be a crucial first step and this group can then work with the group of experts from Denmark.

The support from the MOP-Group could come at three levels.

- At management level for institutional adjustments
- At scientific/lectures level for curriculum changes and training of teachers
- At core group level for close counselling and support

The MOP-Group consists of researchers/teachers from:
The Royal Veterinary and Agricultural University in Copenhagen (KVL)*
- Unit for Learning and Bioethics.
The Danish University of Education (DPU)
The Danish Institute of Agricultural Information and Education (LOK)

Contact: Coordinator of MOP-Group Associate Professor N. Sriskandarajah sri@kvl.dk and
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* KVL has been involved in research collaboration with other agricultural universities in Africa, e.g. University of Harare, Zimbabwe, Sokoine University, Tanzania, Bunda College, Malawi and others. Close links are also being maintained with leading institutions in educational reform in agriculture such as the University of Western Sydney, Hawkesbury, and a number of networks in Europe. This way of approaching research in close dialogue with the surrounding society, has also been an important tool in these Enhancement of Research Capacity Projects (ENRECA). The approach has proven to be beneficial to both students and scientists and ultimately also to the society at large.

Expression of interest on Uganda-Denmark research collaboration No.20
DIIS

'Farmers empowerment and outreach of agricultural service provision'

(same as number 1)