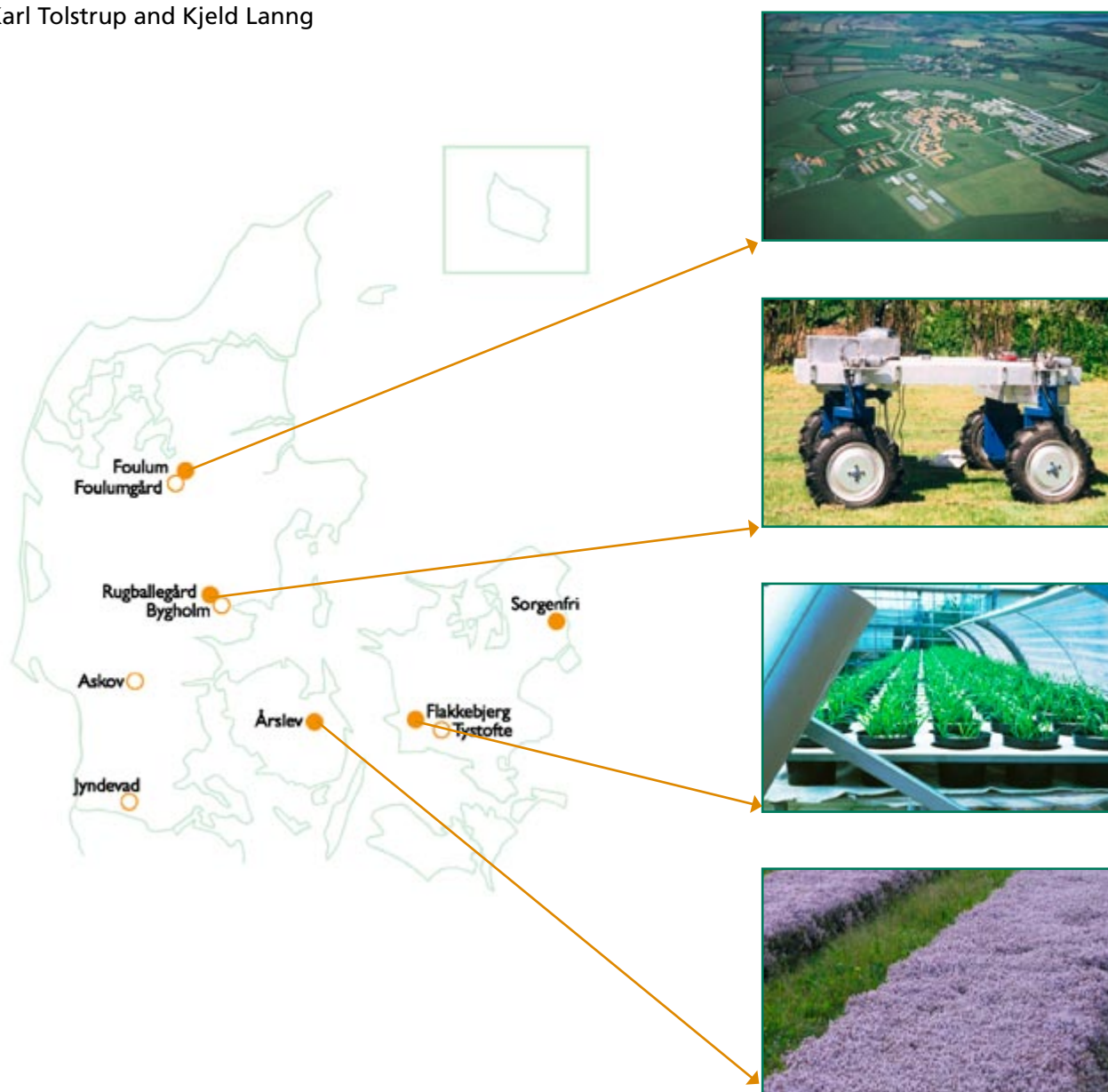




# Supporting the Contribution of Higher Education Institutions to Regional Development in Jutland Funen

Subreport Danish Institute of Agricultural Sciences

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## 1. Summary

The present report is the contribution of the Danish Institute of Agricultural Sciences (DIAS) to the Jutland Funen project within the OECD project programme: *Supporting the Contribution of Higher Education Institutions (HEIs) to Regional Development*. The report is based on a series of interviews with external and internal key persons. In addition, available written material has been included.

The Danish Institute of Agricultural Sciences is a public sector research institution under the Ministry of Food, Agriculture and Fisheries. The major tasks are research at the highest international standard, providing expert advice to public authorities and national advisory services and contributing to higher education. In addition, DIAS wishes to develop regional cooperation in relation to its five regionally located research centres and thus contribute to regional industrial development.

The location of the DIAS research centres – each with their specific core areas and major competences – corresponds very well with the geographical distribution of specialized agricultural areas. The Foulum and Bygholm research centres are situated in Jutland, where the majority of Danish livestock-, dairy- and pig production is found, and the Aarslev research centre is situated in Funen, where the majority of the Danish horticultural sector is located.

As regards expert advisory service to public authorities DIAS emphasizes the balance between agricultural production and environmental consideration. Considerable focus is attached to this particular research area, which – in relation to the development of rural districts – constitutes an area of potential future regional cooperation.

The regional support measures from the State and EU promote a series of mechanisms supporting regional development, such as e.g. projects under the regulations of the Innovation Act and the State Support to rural district development. Added to this are innovation environment initiatives from counties and municipalities, actors in the field of industrial promotion, centres and networks, including initiatives from The Jutland Funen Science and Enterprise Network (*“Jysk Fynsk ForskerKontakt”*).

Numerous challenges are attached to the cooperation with the private sector, and company culture and traditions are of significant importance. DIAS has a long tradition for an extensive cooperation with the advisory services and the various industrial organizations within the agricultural sector, including the joint financing of research- and development programmes, which – though often nationally oriented – may be of considerable regional importance. Numerous examples of cooperation between DIAS and private companies exist, also at a regional level. This kind of cooperation is increasingly strengthened as part of a national focus on an increased application of research results in trade and industry.

DIAS participates in – and often acts as the initiator of – project cooperation and network formations with universities, educational institutions, advisory services, trade, industry and companies.

The relations to the universities in the Western part of Denmark are – to a very high extent – characterized by complementarity as to professional core competences; a fact that makes the universities very suitable cooperation partners. In addition, a series of unique research facilities, which are used in cooperation projects, are available at DIAS – an area holding promising development potential.

The report contains examples of mechanisms, which DIAS – in cooperation with national and regional actors – has established in relation to the three research centres in the Jutland-Funen region. These mechanisms include centres and networks, innovation environments, research facilities and actual projects that reflect local/regional areas of interest based on visions aiming at the strengthening of the agricultural sector and its spin-off activities.

Regarding technology transfer DIAS emphasizes the importance of protecting the scientists' inventions – whenever this seems relevant – with a view to commercialisation in the form of spin-off activities or by allocation of company contracts. Compared to “other” Danish research institutions DIAS has a good performance as regards technology transfer. However, the innovation environments that DIAS cooperates with, encourages DIAS to flexibility in relation to technology transfer and commercialisation and also to formalize its fundraising and commercialisation in order to ensure that the scientists are given sufficient time for performing their research.

DIAS is the initiator of a new technology transfer project aiming at specific core competence areas. The project encourages a close dialogue between selected scientists and companies, and new concepts are developed from idea to commercialisation or to problem solution. The initiative should be seen in relation to e.g. The Science and Enterprise Network, and holds excellent possibilities for strengthening the regional perspective.

DIAS has experiences as regards industrial PhD students and industrial post-doc positions in cooperation with private industries; experiences indicating that this seems a very immediate and direct way of transferring knowledge and know-how and may constitute an area of development that corresponds very well with other innovative initiatives. Research contracts with major Danish companies seem to be another natural possibility to achieve an improved utilization of DIAS competences.

In spite of DIAS efforts in relation to dissemination as well as openness in connection with more initiatives, DIAS is still regarded as “not being very visible” in the region. Still, DIAS is encouraged to be more open and to tell all the success stories.

It appears from the study that DIAS has research- and educational competences, which are not fully utilized today. Alternatively, these may be used in connection with regionally oriented company networks and projects with companies. Today, however, regional development funds are usually not aimed at actual research. Regional research funds thus seem a natural means to promote regional engagement and to implement ideas arising from knowledge centres and networks. Such resources would enable support to research projects aimed towards regional industrial development, and focusing on research areas that are important to the region.

Though education is an important DIAS activity, DIAS has not – contrary to the universities – its own education/training of students. DIAS has, however, always participated in educational activities – primarily higher education – by means of its cooperation with universities and the Royal Veterinary and Agricultural University (KVL) or vocational education within relevant professional education/training. The report lists a series of positive examples of educational cooperation of regional relevance. Among the most important are graduate- and PhD theses prepared in the various DIAS departments. The new Act on public sector research sets higher priorities for DIAS's educational role, just as more evident incentives and frameworks in relation to education activities are expected. This evaluation indicates that there is a general wish in the Jutland Funen area to maintain and develop agricultural education at university level, but located in the region.

DIAS wishes to emphasize the importance of new differentiated educational provisions and options, including Internet-based education, and also to play an active role in relation to lifelong learning. The Communication Centre for Natural Science and Agriculture contributes considerably to young people's knowledge of agriculture and natural science by means of the Centre's initiative "Scientist for a day" – an initiative closely related to scientific activities in DIAS research departments. Furthermore, DIAS attracts foreign visiting scientists, who also contribute to an international research environment in the region.

By virtue of its size DIAS is an important place of work in the Jutland-Funen region. DIAS employees have a relatively high level of education and contribute actively – according to more of the interviewed persons – to the engagement and increased diversity in the region. Speaking in terms of culture DIAS contributes via the purchase of works of art. Significant sums are allocated for this purpose in connection with building and reconstruction. Art societies emphasizing the exhibition of the works of local artists are also found at DIAS.

One of DIAS's purposes is to promote environmentally sustainable solutions within agricultural production, as well as within the general development of society, and there are several examples of DIAS cooperating with regional actors and decision makers.

DIAS enjoys considerable and wide political support in the counties and the local communities, just as DIAS is included in the development strategies of these, and DIAS is considered to play a very important role in the region. Their support also includes making mechanisms available for the interaction, which may result in an increased innovation and transfer of knowledge. There is an ongoing mutual dialogue between DIAS and the counties and local communities concerning marketing and coordination of activities. Similarly, the local "business and trade promotion systems" are made available for DIAS and active cooperation exists in this area. The food area is very central in regional development strategies, and there is a significant interest for an increased bridging in relation to public research institutions.

DIAS is very proactive in connection with the new formation of regions and the structural reforms, including "The Regional Growth Forums". DIAS is expected to play a central role and to place agricultural science potential at the agenda when discussing regional industrial and societal development.

However, if DIAS commits itself too deeply to regional issues this may weaken the scientific, national research reliability. The central basis should still be international and national agricultural research of a very high standard. This is a decisive requirement in order to continue the contribution to regional development within areas that are especially relevant to regional and local development.

## **2. About the Danish Institute of Agricultural Sciences (DIAS)**

The Danish Institute of Agricultural Sciences is the largest public sector research institution in Denmark. It is an institute under the Ministry of Food, Agriculture and Fisheries, subject to the Act on Public Sector Research (Act no. 326 of 5<sup>th</sup> May, 2004).

Research activities are performed at centres in Foulum, Bygholm, Aarslev, Flakkebjerg and Sorgenfri, and to these should be added four experimental stations. Fig. 1 shows the geographical location of DIAS research centres and experimental stations. As it appears the research centres Foulum, Bygholm and Aarslev are situated in the Jutland-Funen area.

The Danish Institute of Agricultural Sciences carries out research within natural, technical, agricultural and veterinary sciences and development. The research activities are organized in departments covering DIAS's core research areas in the production chain from farm to fork.

A DIAS Service Department supports research activities and attends to work tasks in relation to experimental research, such as e.g. Farm Management and Research Facilities, library and information service etc.



*Fig.1 Danish Institute of Agricultural Sciences – research centres (●) and experimental stations (○).*

DIAS has modern specialized laboratory facilities and unique research facilities, including purpose-built livestock buildings, greenhouses and laboratories as well as a considerable farmland area for experimental research and animal feed production.

In 2004 DIAS employed 356 scientists and 573 technical/administrative employees; a total of 929 employees, distributed among the DIAS research centres. DIAS had a turnover of approx. 562<sup>1</sup> million DKK, of which approx. 265 mill. DKK – or approx. 47 % – were received as a net appropriation from the Ministry and approx. 300 mill. DKK were work grants from various programme- and project appropriations, grants etc. from public as well as private licensors.

A Governing Board appointed by the Minister of Food, Agriculture and Fisheries constitutes the DIAS management. The DIAS Governing Board consists of 16 members all representing relevant external research, end users of research results within the industry, as well as all the employees at the institution. The Board of Directors is in charge of the day-to-day running of DIAS.

The DIAS Strategy, the Performance Contract, the DIAS Scope and Activity Plan and The DIAS Annual Report are all used as management tools in relation to superior as well as specific planning and reporting.

<sup>1</sup> Expenses are exclusive of the contributions from subsidized research activities to joint expenses

### ***DIAS core research areas***

DIAS carries out fundamental, strategic and application oriented research, as well as innovation with a clear social target.

The purposes of DIAS are to:

- Offer expert advice to authorities, industries and consumers within the fields of DIAS's core research areas
- Service public authorities
- Engage in development efforts with a clear social aim
- Disseminate – and attend to the transfer of knowledge and technology of DIAS research to relevant public and private interested parties
- Accomplish operational tasks in relation to the above.

The scientific core research areas comprise:

- Genetics and biotechnology
- Animal health, welfare and nutrition
- Food science
- Horticulture
- Agroecology
- Agricultural engineering
- Integrated pest management.

### ***Vision***

To be recognized – nationally and internationally – for performing relevant experimental agricultural and food research including innovation at the highest international standard; research that makes an important and effective contribution to industrial competitiveness as well as social productivity and a sustainable development.

### ***Strategy***

The main activity at DIAS is research, and research and development activities constitute the basis for the solution of other DIAS tasks.

- The research efforts at DIAS are developed and prioritised through international research cooperation and a close interaction with claimants, users and interested parties with due consideration to the need for specific research results and solutions as well as to the scientific and economic possibilities.

The DIAS Strategy is a research strategy consisting of seven sub strategies describing the procedures, the methods and the means applied by DIAS in order to achieve the goals incorporated in the DIAS mission and vision.

Thus, DIAS aims to:

- Conduct long-term basic, strategic and application oriented experimental research and development to support knowledge building and the development of new solutions.
- Be visionary and proactive in choosing and establishing core research areas and concerted actions.
- Participate in research cooperation with nationally and internationally recognized research environments that are complementary to DIAS efforts; these efforts are focused at scientific areas in which DIAS has an internationally strong position.

- Strengthen and expand its experimental research and development through focusing, interdisciplinary and a general understanding.
- Protect scientific ethics as laid down in the Act on public sector research institutions by preparing a policy and a process plan for the area in question.
- Attract internationally recognized scientists with a high level of professional and personal accomplishments.
- Disseminate scientific results in international, recognized journals with a high impact index.
- Ensure that the institution's competences and facilities are also applied in adjacent biological research areas.

In addition, DIAS has seven sub strategies comprising *advisory service, quality assurance, communication, innovation, development of competences, education and organisation development*.

In relation to regional cooperation it is a DIAS sub strategy to:

*"Develop regional cooperation in relation to the five regionally located research centres which thus contribute to regional development in Denmark as well as to develop the best possible scientific and organizational networks internally at DIAS in order to be able to produce interdisciplinary solutions"*.

### 3. Evaluation design

The present report is the contribution of the Danish Institute of Agricultural Sciences (DIAS) to the Jutland Funen project within the OECD project programme: *"Supporting the Contribution of Higher Education Institutions (HEIs) to Regional Development"*.

The Danish Institute of Agricultural Sciences, Aalborg University (AAU), the University of Southern Denmark (SDU), the University of Aarhus (AU) and the Aarhus School of Business (HHÅ) participate in the Jutland Funen project.

The purpose of this study is:

- To evaluate DIAS's contribution to regional development, capacity building and interaction with other regional actors
- To render the importance of DIAS and its interaction with regional actors more visible
- To increase the awareness of future possibilities of promoting regional development.

The study may contribute to:

- Strengthen the interaction with regional actors – including scientist cooperation with industries, educational institutions, authorities, private and public institutions and other actors.

The evaluation emphasizes information from selected internal and external key persons, which have been interviewed in semi-structured interviews based on the OECD guideline. Internal key persons include the DIAS management as well as research directors and a few employees in other leading positions. A total of 12 internal interviews have been accomplished. External key persons include representatives from universities, educational institutions, knowledge centres, innovation environments, advisory services, industry, and promotion actors within the industry, counties and municipalities. A total of 21 external interviews have been accomplished. A list of



interviewed key persons is enclosed. Furthermore, additional background material has been used, cf. the bibliography list.

## **4. Research and innovation**

### **4.1 DIAS's regional perspective**

As a Danish public sector research institution DIAS is international as to research activities, it has a national role in relation to providing expert advice to public authorities, and plays a regional role in connection with industrial development. Local and regional cooperation, as well as, transfer of knowledge and technology are included in the DIAS strategy, and there is an increased focus on the regional importance of the DIAS research centres as to growth and development. The location of the research centres in different regions aims at such regional effects – within primary and secondary production, processing and spin-off activities, as well as, in a broader regional-economic sense.

A considerable concentration of food producing companies is found in the Jutland-Funen area. However only to a minor extent, is DIAS' research directly connected to regional political considerations. On the other hand, the significant similarity between the scientific profile of DIAS and the industrial structure results in a range of cooperation relations and joint projects, although the starting point for such cooperation will always be scientific rather than a question of the geographical location of the cooperation partner. The industrial cooperation between DIAS and the Jutland-Funen region is naturally strengthened by the location of important agricultural partners in the area; partners such as the Danish Agricultural Advisory Service (the National Centre), various industry- and trade associations such as The Danish Dairy Board, The Danish Cattle Federation, the Danish Fur Breeders Association, The Danish Association of Horticultural Producers, as well as ARLA (head office), Danish Crown (head office), Danisco a.o.

DIAS carries out agricultural research at the highest international level and aims at specific core competences with long-term goals. This is the special role of DIAS and it is decisive to the quality of the national and regional research- and educational cooperation, and it is essential to regional industrial innovation at the premises of globalisation. DIAS wishes to be more visible in the Jutland-Funen area, and emphasizes the importance of bridging between international, national and regional research and innovation.

### **4.2 Specific commercial and regional conditions and DIAS activities located in the Jutland-Funen region**

In recent years the Danish agricultural sector has experienced a tremendous structural development, not least in the Jutland-Funen area. During the last decade the number of Danish farms has decreased by 37 % and the average farm area has increased by 52 %. During the same period the number of persons employed within agriculture and related industries has decreased by approx. 20%. In 2003 the agricultural sector employed approx. 187,000 persons, corresponding to 7 % of the total Danish labour force.

The related industries such as slaughterhouses, dairies and feedstuff companies have experienced a similar structural development. In 1960 there were 1350 dairies in Denmark – these had been reduced to 40 in 2003, and of a total of 77 slaughterhouses in 1962 only 2 remained in 2003. By means of mergers the Danish cooperative societies within dairies and slaughterhouses have become the largest in Europe and the turnover in each of the two sectors thus constitute 50 billion DKK – the total Danish agricultural turnover is 129.3 billion DKK (Danish Agriculture, 2004).

About 2/3 of the Danish agricultural production are exported at a total value of approx. 54 billion DKK, of which pork meat (approx. 20 billion), eggs and cheese (7 billion) constitute the major part of exports. Fur skin exports total 4 billion DKK, and constitute 40 % of the world's total fur skin turnover. The export of agricultural products constitutes approx. 13% of the total Danish export of goods.

Food prices increase less than the average price increase as indicated by the fact that the cost-of-living index has increased by 63%, whereas food prices have only increased by 46%.

Agriculture has doubled its productivity since 1990, which is far more than other industries and trades and this is achieved by targeted research- and advisory efforts, as well as the ability of the agricultural sector to utilize new technologies.

During the last 20 years Denmark has experienced an increase in pig- and poultry production and a corresponding reduction in cattle herds. The total number of livestock is almost constant. About 80 % of all cattle farms and pig farms are located in the Jutland-Funen area, and as it appears from fig. 2, the largest concentration of pig and cattle production is found in the Jutland-Funen area.

Crop cultivation follows the production of animal husbandry in the form of extensive areas used for forage in these regions. In addition, special crops are cultivated – mainly oil seed rape and potatoes used for potato starch production.

During the last decade the number of organic farms has increased, and the organic area constitutes a little less than 7% of the total cultivated area. In the Southern part of Jutland the organic area constitutes 22% of the total cultivated area, primarily due to a considerable organic milk production.

Important national industrial clusters within pork meat, dairy products, seeds and fur breeding have been established in the agricultural sector. Organic food is characterized as a potential industrial cluster. Furthermore, a regional industrial cluster within horticulture has been established in Funen. (National Agency for Enterprise and Construction, 2001; Jutland-Funen Business Cooperation Scheme, 2002)

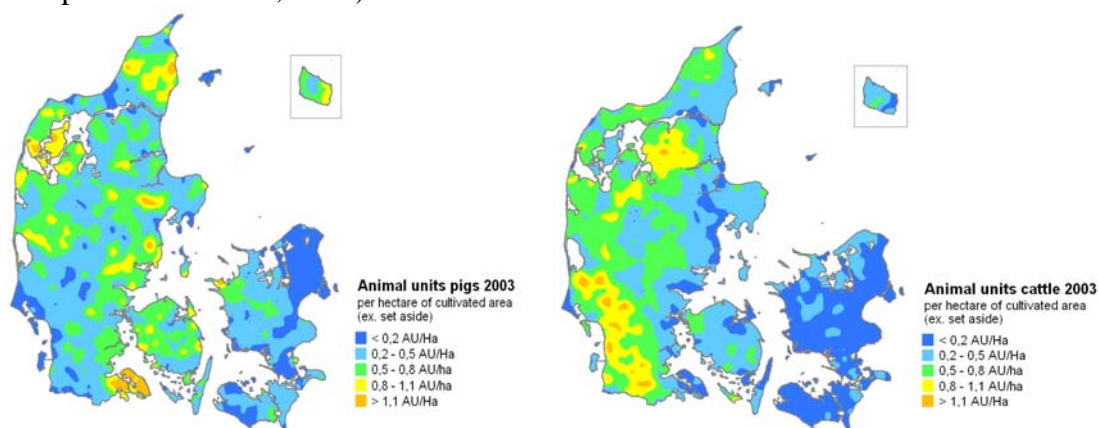


Fig. 2 Number of animal units, pigs and cattle per hectare of cultivated area (I.T. Kristensen et al. 2005).

Many small and medium-sized companies and a rather large agricultural sector characterize the industrial structure in Viborg County, where DIAS main research centre is located. The decrease in employment within this sector is particularly significant in rural districts such as Viborg County, in which about 1/3 of the total labour force is employed within agriculture and food production. The corresponding figure for the entire country is approx. 20 %. Both the educational level and the unemployment rate are relatively low in the county.

In Funen County – as in the rest of Denmark – the major area of employment is within the sector of public and personal services, characterized by industry and commerce etc. Agriculture is of some importance, but Funen has also experienced a decrease. However, Funen County has a considerable and extensive horticultural production with a rising trend, and more than half of the Danish greenhouse areas are found in Funen. The structural development within Danish horticulture is similar to that of other agricultural industries, and employment within primary horticultural production constitutes a little less than 8,000 persons per year. In 2003 the value of the total horticultural production constituted about 4 billion DKK. Ornamental plant production in greenhouses constitutes the major part of the production value followed by vegetable production. The production value has stagnated, and both exports and home market sales have decreased in recent years.

Speaking in general terms, the agricultural industry is under pressure due to increasing production costs, increasing environmental requirements and stagnating prices. The trend is towards increased efficiency and bigger production and sales units aiming at bigger markets. However, issues such as niche productions and knowledge-intensive high-value products also exist.

### ***DIAS research centres***

The location of the DIAS research centres, and the core research areas of these, corresponds very well with the geographical distribution of specialized agricultural areas.

Research areas and number of employees at the DIAS research centres appear from table 1.

*Table 1*

<b>Research areas and number of employees (per year) at the DIAS research centres</b>		
<b>Research centre</b>	<b>Employees</b>	<b>Research areas</b>
Bygholm	60	Agricultural engineering
Flakkebjerg	162	Genetics and biotechnology (plants), Integrated pest management
Foulum (Including experimental stations)	552	Genetics and biotechnology (animals), Animal health, welfare and nutrition, Agroecology, Food Science
Sorgenfri	32	Integrated pest management
Aarslev	99	Horticulture, Food science (vegetables)
Skælskør	24	Variety testing
<b>Total</b>	<b>929</b>	

Research Centre Foulum is situated in the municipality of Tjele in Viborg County, and is the principal DIAS research centre. Activities have been built up gradually since 1984, when the Danish Institute of Animal Science and the Danish Institute of Soil Science moved from Copen-

hagen to Tjele in 1992. In 1997 the two institutions merged to form the Danish Institute of Agricultural Sciences. Viborg County has Denmark's largest pig production, and both Viborg county and Viborg municipality support DIAS; for instance by supporting the establishment and operation of the innovation environment Agro Business Park, and in the form of new facilities within the field of manure and biomass treatment technology. At research centre Foulum a high-tech "Knowledge Centre of Manure and Biomass Treatment Technology" is being prepared.

Research Centre Aarslev is situated in the municipality of Aarslev in Funen County. The centre has just celebrated its Centennial jubilee, and the Department of Horticulture plays a significant regional role via its close cooperation with the horticultural industry. The horticultural industry enjoys a strong regional attention, as does the DIAS research centre in Funen, which also enjoys a significant regional political support. The regional growth environment of "Development Centre Aarslev" is also situated at Aarslev.

Research Centre Bygholm is situated in the municipality of Horsens in Vejle County. The area houses a concentration of agricultural production and food industry, e.g. Danish Crown – one of the world's biggest and most modern slaughterhouses, a series of food companies, agricultural machinery works, several agricultural boarding schools and a number of large pig farms. Research centre Bygholm is the only research institution in Horsens.

The research centres of Flakkebjerg and Sorgenfri are located outside the Jutland-Funen area, and houses the Department of Integrated Pest Management, as well as parts of the Department of Genetics and Biotechnology. The expertise of these centres forms part of various project relations with Jutland-Funen activities – internally as well as externally – and thus helps to strengthen regional activities. The regional growth environment "Seed Cluster" is located at research centre Flakkebjerg.

#### **4.3 Specific external conditions/framework conditions influencing the regional utilization of DIAS research and innovation**

In recent years a series of State initiatives have been taken to ensure a positive regional development in Denmark, for instance "Business Academies", "Regional Growth Environments" and the so-called "Jutland-Funen Initiatives". Representatives for the two initiatives first mentioned are among the interviewed key persons.

The Ministry of Food, Agriculture and Fisheries supports innovation, research and development within the sector of food, agriculture and fisheries in relation to the Innovation Act. This is a clear incentive for cooperation between research and industry. Furthermore, the Ministry supports a special rural district programme aimed at regional development. The programme does not provide actual research funds, but DIAS competences within environmental engineering and planning are highly applicable in this respect.

The DIAS readiness as to technology transfer in the form of commercialisation of research results has been established as a consequence of the "Act on inventions at public research institutions", and includes the protection of rights in relation to inventions at DIAS, typically by means of patenting, as well as license agreements and establishment of spin-off activities based on DIAS innovations.

DIAS has established a "technology maturing fund" in order to turn the patent cases in progress into commercial results, and the Ministry of Science, Technology and Innovation has granted funds for purchasing external assistance to accomplish news value analyses, patent applications,

market analyses and business plans. The scientists' patent applications will constitute merit work along the lines of traditional publishing.

#### **4.4 Incentives and barriers to cooperation with companies**

It is extremely important for a research institution to cooperate with companies. However, companies will often be cautious and unobtrusive, and therefore it is very important to create interdisciplinary networks, for instance via The Science and Enterprise Network ("ForskerKontakten"). Below is a list of essential incentives and barriers to cooperation:

Incentives for companies:

- Access to utilize research-based knowledge
- Possibilities of influencing research efforts.

Incentives for scientists:

- Merits for cooperating with companies
- Financing of research.

Incentives for both parties:

- Common areas of interest to both the company and the scientists are identified
- Potential new synergies
- Contributions to social development.

Barriers:

- Lacking knowledge of DIAS research and facilities
- An initial scepticism, when a new company/scientist relation is made
- Company culture – is the company open to new ideas?
- Educational level within the company
- The non-acceptance of industry and companies as to DIAS's wish to protect the rights in relation to inventions
- DIAS is relatively heavy as to costs. Economy is a mutual problem
- Small companies find it difficult to formulate their wishes
- Large companies with their own research may be less prepared to cooperate.

*Scientists and company staff constitutes two different cultures, but people are different, and some people find it easier to cooperate than others.*

## 4.5 Cooperation, initiatives and mechanisms encouraging the utilization and transfer of knowledge

### *Cooperation projects, agreements and research contracts*

DIAS regards project cooperation to be an essential method of strengthening research platforms and of disseminating knowledge. The specific cooperation projects are formalized via applications, project plans and cooperation agreements, which establish rules for project organization, IPR, confidentiality, publication, etc.

### Universities

Superior framework agreements on research- and educational cooperation, as well as actual cooperation between DIAS and the three universities in Jutland-Funen exist. DIAS also has an extensive national cooperation with e.g. The Royal Veterinary and Agricultural University (KVL) in Copenhagen and other Danish research institutions. Additionally, DIAS has considerable international cooperation relations with foreign universities and institutions, e.g. in connection with EU projects – in relation to the latter DIAS acts as the coordinator in several projects.

DIAS tries to find cooperation partners based on expertise and the best possible complementarity. The main philosophy is cooperation between equal partners. DIAS has a bridging function, and creates relations between international agricultural research and the universities in Jutland-Funen, as well as between the agricultural sector and the universities. An example of this is the area of agricultural engineering found at research centre Bygholm. DIAS often acts as an originator, and agreements may be made at a high level between the institutions, or – as it happens frequently – through more informal cooperation via personal contacts between scientists or via networks.

Furthermore, DIAS has entered into agreements and project cooperation with university hospitals, e.g. in connection with projects on knee operations with Aalborg University (AAU), and in connection with allergy projects with the University Hospital in Odense. Several departments regard a closer cooperation with the humane health area to be a potential field of development.

In interviews with university staff it was emphasized that cooperation may be intensified, as the trend is towards a broader university concept – more like the American university model – and continuing education should be prioritised in relation to medium long educations.

Research and education quality should be of the highest possible standard – globally speaking this is what counts.

*Three elements are important in relation to DIAS's cooperation with universities: Complementary competences, personal relations – make cooperation much easier – and financing.*

### Cooperation with the advisory service

The Danish Agricultural Advisory Service, the National Centre, is the major advisory service within the agricultural sector. The centre has approx. 460 employees, is situated close to Aarhus, and has entered into partnerships with local agricultural advisory centres all over the country. The special role of the National Centre is to collect, generate and disseminate knowledge and innovation to the local agricultural advisory centres – and thus to the farmers.

DIAS provides a major part of the scientific foundation in relation to the dissemination of knowledge from the agricultural advisory service to the primary producers. The trend is, however, towards an increasing dissemination of knowledge directly to the producers by means of web-based solutions. DIAS has a general cooperation agreement with the National Centre under The Danish Agricultural Advisory Service.

When interviewing staff from The Danish Agricultural Advisory Service, the National Centre, the following comments were mentioned:

The cooperation with DIAS is emphasized in connection with an efficient utilization of research results and joint projects, e.g. in relation to web-based information and the Action Plan for the Aquatic Environment.

The traditional flow of knowledge from DIAS to the National Centre, then to the local agricultural advisor and further to the farmers is changing. - To an increasing extent the farmers themselves seek the required knowledge wherever it is available. The transformed agricultural structure – consisting of larger production units – thus affects the need for advice and information. Generally, every task should be more efficient and the application and adaptation of research results within the industry should be more rapid. It is important to develop a close cooperation ensuring a rapid exchange of knowledge in relation to projects that are smoothly implemented.

A more secure financing of DIAS research would help increase the respect as to the mutual distribution of roles and would also allow for the establishing of long-term research projects with a view to far-sighted industrial development. As regards actual research DIAS is advised not to be too regionally involved, whereas the institution should be regionally oriented regarding the implementation of research results.

The structural development will increase competition but may also be able to strengthen cooperation, as DIAS and the National Centre, will become increasingly dependent on each other, and may increase cooperation relations, in which The Danish Agricultural Advisory Service, the National Centre, will be in charge of dissemination and implementation, and DIAS will be in charge of research and more long-term issues. It is a great advantage that the Danish agricultural sector is very well organized compared to other sectors, and that the information systems fundamentally are well functioning.

#### Industrial organizations and companies

Within agriculture the cooperation with industrial organizations is not regionally oriented – but rather nationally oriented. The cooperation, however, may be of considerable regional importance. A close cooperation with the agricultural industrial organizations regarding joint financing of research and development programmes exists. Such activities are performed as "Subsidized Research activities", for instance projects under the Innovation Act, the research results of which are available to the public. DIAS often acts as project manager and coordinator, as companies are not very experienced with this. Steering committees consisting of participant representatives closely follow and evaluate the projects.

Within its core research areas, DIAS is especially attractive to the industry as a cooperation partner. An example of this is the field of molecular biology where DIAS has close contacts to the pigs and cattle sectors in Scandinavia.

An area in which the cooperation and dialogue is of specific regional importance to the region is the long-term cooperation between the DIAS research centre Aarslev and the horticultural industry, represented by The Danish Association of Horticultural Producers (DEG). Within this field

DIAS participates in many projects partially financed by the industry from production levy funds. Influenced by the development, it is of increasing importance how funds are generated for projects in relation to the innovative issues, and DIAS is encouraged to increase its focus in this particular area.

Other examples that need mentioning are the close DIAS cooperation with the Danish Fur Breeders Association, the activities of which are concentrated in Western Jutland, and the close dialogue with the Danish Dairy Board on specific projects co-financed via the Danish Dairy Research Foundation.

Several departments have a variety of projects under the Innovation Act in cooperation with companies and industries, as well as EU projects within the same scientific area. It may thus be safe to say, that DIAS acts as a bridge builder between international agricultural research and companies.

In these projects it is very common that the involved companies try to implement the inventions made in relation to a product or a production method directly in their companies.

#### Research contracts and commercial services rendered by public institutions

Research contracts occur, but are not widely used in DIAS, and income from commercial services rendered by DIAS constitutes less than 10 % of total DIAS incomes.

Research contracts and mutually binding research cooperation with large companies are interesting issues, which may strengthen research within a certain area as they may provide synergy effects. However, research contracts may also be inconvenient to the institution because of the company's wishes regarding bindings and limitations in relation to further research and publication possibilities.

DIAS offers services in connection with its special facilities, and e.g. The Danish Golf Union and various sports associations have special analyses performed at the DIAS soil physics laboratory in order to achieve a perfect grass cover; and fertilizer distributors from companies in all of Europe are tested at Research Centre Bygholm's special, approved facilities for the European system.

Several of the interviewed persons mention that it may hold promising perspectives for DIAS to enter into research contracts; this might also result in more industry PhD students.

#### Expert advice to public authorities and cooperation with counties

The Action Plans for the Aquatic Environment – which enjoy a significant social focus, and which are performed in close cooperation between DIAS and The National Environmental Research Institute at the initiative of the Ministry of Food, Agriculture and Fisheries and The Danish Ministry of the Environment – entails a considerable contact to the Danish counties. Work efforts in this particular field are long-term and very comprehensive, and at DIAS these efforts involve research environments from four research departments – mainly the Department of Agroecology.

Such expert advisory tasks contribute to provide DIAS with specific core competences within areas of special social focus, and further opens the prospects of applying the DIAS expertise in connection with regional development projects in Denmark, as well as internationally. This potential is not sufficiently applied by the present counties.



For some years DIAS has cooperated with Ringkøbing County in connection with a project on the environmental conditions of Ringkøbing Fiord; and at present DIAS is developing a new concept for the designation of areas sensitive to pesticides. DIAS and the Geological Survey of Denmark and Greenland jointly accomplish this latter project. The project is still in its initial phase, but all counties in Jutland are approached.

DIAS competences were applied in relation to specific problems in the Dynamo-project, focusing on the development of rural districts, and managed and coordinated by Viborg County. The project was very successful, as it was across-sectors and interdisciplinary, just as new innovation environments were created (cf. the facts box).

#### The Dynamo project 2002-2005

##### Purposes:

- To initiate development projects in the agricultural industry and the rural districts in Viborg County
- To implement new knowledge and technologies in practical agriculture
- To strengthen interdisciplinary cooperation between advisory service, research, regional authorities and interested organizations
- To increase the focus on rural district development and "multi-functional agriculture".

Project examples: collective nature plans, well functioning neighbourhood with a minimum of manure odour, feed experiments to reduce pig odour.

Participants: DIAS, Agro Business Park, 6 local advisory centres and Viborg County. The EU and the Ministry of Food, Agriculture and Fisheries supported the project.

<http://www.dynamoprojektet.viborgamt.dk/>

#### ***Centres, consortiums and networks***

In recent years DIAS has made national research cooperation more visible, e.g. via the major cross-institutional centres such as:

- Research Centre for the Management of Animal Production (CEPROS), with KVL and other institutions ([www.cepros.dk](http://www.cepros.dk))
- Animal Breeding Centre Denmark (ABCD) with KVL ([www.ihh.kvl.dk/htm/breeding/ABCD/index.htm](http://www.ihh.kvl.dk/htm/breeding/ABCD/index.htm))
- Centre for Experimental Nutrition and Physiology (CENP) with KVL (<http://www.cenp.kvl.dk/>)
- Plant Biotech Denmark (PBD) with KVL, West Danish universities, Risø National Laboratory and the University of Copenhagen ([www.pbd.dk](http://www.pbd.dk))
- Danish Agricultural Network in Engineering and Technology (DaNet) with AAU, SDU and KVL etc., research institutions as well as advisory services and private companies (<http://www.danet.dk/>)
- Team Horticulture with KVL and DEG ([www.teamhorticulture.dk](http://www.teamhorticulture.dk))

In addition, DIAS participates in the Centre for Advanced Food Studies at KVL, together with the Technical University of Denmark regarding research and education within the food area. Several DIAS departments participate in the NaNo FOOD Centre at the University of Aarhus.

The creation of centres provides an increased international impact within research and education as well as a mutual strengthening of the partners.

Naturally, networks, centres and consortiums – with the participation of industries and companies – will be more application oriented, and will be highly efficient in the promotion of innovation and technology transfer.

Examples of this are described below:

#### The Danish Research Centre for Organic Farming, Foulum

##### **DARCOF**

The Danish Research Centre for Organic Farming was founded in 1996 – head office at Foulum.

DARCOF is a “centre without walls”, and at present the cooperation comprises scientists from 20 different institutions.

The purpose is to coordinate and encourage cooperation within organic agricultural research.

A board of directors heads DARCOF with representatives from DIAS, KVL and other Danish institutions. The Board has appointed a user committee consisting of representatives from trade and industry.

Activities comprise research, coordination, international cooperation, scientist education and dissemination.

[www.foejo.dk/](http://www.foejo.dk/)

In an interview the chairman of the national association “Organic Denmark” evaluated DARCOF as follows:

Just like DIAS, DARCOF is a national and international actor. The generated knowledge is not particularly aimed towards the region, but naturally the research activities performed will have an effect on the Jutland-Funen area.

An organic experimental station is established under DIAS at Rugballegaard. So far, the main research area has been the primary production. A new programme has been targeted towards the processing industries such as dairies.

DARCOF is regarded as a strong actor and is considered to be more prepared to look for cooperation partners than DIAS. However, The organization structure (a centre without walls) renders DARCOF less visible. “Organic Denmark” would – if sufficient financing was available – be very interested in establishing an actual organic centre, e.g. at Rugballegård. Such a centre would make it possible for an international team of scientists in this field to utilize each other’s competences.

#### Knowledge Centre of Manure and Biomass Treatment Technology, Foulum

For many years Denmark has been leading in research and development of new technology within manure and biomass treatment, and due to research the environmental problems have been significantly reduced. In order to utilize these research advances, DIAS initiated the establishment of the Knowledge Centre of Manure and Biomass Treatment Technology at research centre Foulum in 2004. Existing knowledge is gathered here, and new research projects are initiated. Experimental biogas and manure separation facilities will be built at Foulum in con-

ated. Experimental biogas and manure separation facilities will be built at Foulum in connection with the Knowledge Centre. (S.G. Sommer, 2004a and b; <http://www.manure.dk/>)

The Knowledge Centre is an open network, and DIAS will be in charge of the research and the biogas and manure separation facilities, whereas the Agro Business Park and Viborg County will be in charge of more industry-oriented activities. The West-Danish universities participate in the research along with a series of other universities and public sector research institutions. In addition, the counties of Viborg and Funen participate just as The Danish Agricultural Advisory Service, a series of associations and a total of 30 companies, the majority of which is located in Jutland and Funen.

The efforts are supposed to place Denmark at the front of development within the reduction of environmental problems and obnoxious smells from agricultural production, and the impact on regional industrial development may be considerable. Several companies in the agricultural sector have set up business in the Agro Business Park, and a production company with 200 employees has also set up business in the area. In addition, DIAS and SDU have established a joint professorship in the field of "Animal Waste Engineering".

#### Development Center Aarslev , Funen.

**Development Center Aarslev (UCAA).** Purpose: practical utilization of research knowledge in the horticultural sector within processing, food, engineering, automation, robot technology, medical industry etc.

Projects:

Plants for Health: [www.plantertilsundhed.dk](http://www.plantertilsundhed.dk)

Horticultural technology: [www.ucaa.dk](http://www.ucaa.dk)

The regional network includes: DIAS and SDU, DEG, a growers' association, polytechnics and engineering colleges, industrial promotion actors and Funen County.

Funded by The Ministry of Science, Technology and Innovation, Funen County and private parties. Secretariat placed at DIAS, Aarslev.

There is a need to find new and alternative industrial areas and plant products in the horticultural industry. The vision is to make Funen the centre of development and production of plant medicine. This vision is described in "A new billion worth industry – a white paper on plant medicine", published by Huset Mandag Morgen A/S on behalf of Funen County.

In an interview with Development Center Aarslev the following comments were made:

Development Center Aarslev has acted as a catalyst in relation to a series of projects, in which the DIAS research centre Aarslev has entered into cooperation with new "cooperation partners". The new projects and constellations constitute an obvious strengthening of the research and the cooperation between SDU and DIAS and for the other actors as well – and major opportunities exist for a transfer of knowledge to the involved parties.

The Development Center has written a number of applications – with a very high success level, and DIAS is the major receiver of contributions. "DIAS spends a lot of time on applications, and the idea is suggested to build a task force at the Development Center to attend to routine tasks and allow for the scientists to concentrate on actual research".

UCAA participates in several networks under The Science and Enterprise Network (ForskerKontakt) and also participates (with Funen County) in an EU INTERREG project in cooperation with the University of Kiel (KERN region) concerning "Plants for insulin treatment".

#### TCM Denmark in Funen

The consortium "TCM Denmark" was established in 2004 as an offspring consortium in connection with the "Plants for Health" project under UCAA. The name TCM stands for "Traditional Complementary Medicine", i.e. "natural medicine", which is used as ordinary medicine in the country of origin. Consortium participants are Funen County, Funen Enterprise Development Centre, Odense municipality, DIAS, SDU, the University Hospital in Odense and the Science Parks of Southern Denmark. Companies from countries, in which "TCM" is widely applied, are offered a package deal consisting of plant research, testing, approval and commercialisation of products in the EU. It is the vision to make Funen the natural entrance gate for "natural medicine" for the European market.

The TCM Denmark secretariat is located at Funen Enterprise Development Centre, and the persons interviewed here explain that a cooperation agreement has been made with the Chinese Government concerning traditional Chinese medicine.

In connection with existing contacts with China, DIAS possesses fundamental research competences of significant importance, and according to Funen Enterprise Development Centre DIAS will play an increasingly important role in the development of new test methods and cultivation competences. The creation of a network between scientists and companies is mentioned as an obvious possibility to demystify research. Funen Enterprise Development Centre has contributed to interdisciplinary conferences between the various centres/networks, i.e. Seed Cluster, Development Center Aarslev and Robocluster.

#### The Danish Cattle Research Centre, Foulum.

The Danish Cattle Research Centre (KFC) is founded by cattle husbandry organizations in Denmark, and is run in close cooperation with DIAS. KFC regards itself as a bridge builder communicating knowledge to scientists, industries, advisory services and farmers. In addition, the premises of KFC also functions as a natural meeting place for scientists and farmers to meet and discuss ideas.

#### **The Danish Cattle Research Centre (KFC)**

KFC carries out research in relation to cattle feeding, breeding, health, behaviour and quality of milk and meat.

KFC vision and aims:

- To accomplish experiments benefiting the development of Danish cattle husbandry
- To ensure an active interaction between research and the cattle sector
- To ensure an efficient dissemination of new research results
- To develop an attractive place to visit for cattle holders and for society as a whole
- To establish and maintain international contacts within research

The cattle sector and DIAS jointly decide which research projects should be accomplished. DIAS is responsible for research issues in relation to KFC experiments.

Established by agricultural societies, Danish Cattle Federation, The Danish Livestock and Meat Board the Danish Dairy Board and Danish Cattle Breeding Associations.

[www.kfc-foulum.dk](http://www.kfc-foulum.dk)

According to the interview person Danish cattle husbandry has been strengthened due to DIAS research. The new planned biomass and manure separation facilities are a dream coming true, and KFC looks forward to be a part of this. It has, however, been a rather slow process and as the industry is a fast mover, it would be preferable if DIAS could act more rapidly in the decision-making process.

The cooperation project **BIOSENS** is mentioned as an excellent example of the potential of long-term strategic cooperation between research, companies and industry; a project that will improve the health and welfare of cows and optimise the farmer's economy. The future success criterion for the DIAS-KFC cooperation would be more spin-off activities and more knowledge centres established at Foulum.

**BIOSENS** – research in the future management of the high-yielding cow.

Purpose: to develop management tools to be used by the cattle farmer. Based on analyses during milking the farmer will be able to control and document the health status and production of each individual cow.

A decision supporting system will be finished within a few years.

Participants: DIAS and KFC as well as the private company LATTEC I/S concerning the development of technical equipment.

The project is partly financed by the Innovation Act under the Danish Directorate for Food, Fisheries and Agri Business.

#### The Science and Enterprise Network Jutland – Funen ("*ForskerKontakten*")

**The Science and Enterprise Network (*ForskerKontakten*)** established 2004

The purpose is to support active, scientific networks in which scientists and companies exchange scientific experiences to the benefit of the region's industrial and commercial development.

The Jutland and Funen counties provide the capital for this system in which networks may be financed for up to 2 years.

The target group among companies is small and medium-sized companies in Jutland-Funen. Research representatives are Aalborg University (AAU), the University of Aarhus (AU), the University of Southern Denmark (SDU), The Aarhus School of Business (HHÅ) and DIAS.

DIAS participates in networks in relation to:

- Biomass technology
- Conference on manure treatment technology
- Plant-based health products
- New beef product concepts
- Potato network
- "Food" network
- Local development of renewable energy
- Future greenhouses
- Intelligent agricultural technology

[www.forskerkontakten.dk](http://www.forskerkontakten.dk)

The Science and Enterprise Network is an offspring of the Jutland-Funen Business Cooperation Scheme, and constitutes an excellent example of cooperation between counties and research institutions to promote regional industrial/commercial development.

It is a major purpose to ensure that the companies achieve direct access to the knowledge and technology generated at the research institutions, and also to ensure that scientists are given the opportunity to apply and test their technologies and know how in practice. Since 2004 The Science and Enterprise Network has initiated 28 new networks.

Contact persons have been appointed at the participating research institutions, and these contact persons will provide expert advice as to applications and to the formation of networks. They may further contribute to make contact to new network participants and create the basis for new initiatives.

#### Agricon Valley, Horsens.

The municipality of Horsens initiated the Agricon Valley network, and the participants are the DIAS research centre Bygholm, the educational institution Vitus Bering and approx. 80 leading companies within agriculture and food in the region.

The network also participates in a fairly new cooperation network – the so-called Foodture – Danish Food Innovation Network, based in Vejle County. This is a national network with the purpose of ensuring improved and more competitive products and processes within the food sector.

#### **Agricon Valley**

Consists of companies within the agricultural and food sector and constitutes an area of efforts for Horsens Commercial Council.

The network purpose is to create synergy between research, education, advisory service and production.

Study tours and visits abroad, closing time meetings, “gazelle” conferences etc. are arranged  
About 80 companies participate, and 350 are listed as interested parties.

[www.agricon-valley.dk/](http://www.agricon-valley.dk/)

During the interview with Agricon Valley and the municipality of Horsens the following considerations were mentioned:

The DIAS research centre Bygholm is a very important actor in the local area, and actively participates in a series of joint activities. However, the centre is – in itself – too small to cooperate with very large companies such, as Danish Crown’s slaughterhouses, but when cooperating with e.g. AAU or SDU the research centre possesses the sufficient strength. The DIAS centre Bygholm is regarded as a major bridge builder in the area regarding national and international contacts.

Even though there is a certain pressure on the agricultural sector there is, however, a considerable interest in creating networks. This may be due to the fact that this particular sector has a long tradition for sharing knowledge. Farmers are very good at sharing experiences, and the sharing of knowledge is a significant part of the Danish cooperative movements.

The Agricon Valley network has contacted the Agro Business Park in Foulum, and there is a certain basis for synergy effects via increased cooperation. Further the participating companies are very interested in research.

The DIAS research centre Bygholm has just initiated a cooperation project regarding automation robot technology with Robocluster, a growth environment (network) under the Maersk McKinney Moller Institute for Production Technology at SDU. Bygholm and Robocluster complement each other very appropriately, as Robocluster is in charge of the application-oriented part and has brought more companies into the cooperation. It is the wish to create longer-lasting strategic cooperation between the parties. (<http://www.robocluster.dk/>)

### ***Technology transfer, patents and spin-offs***

In comparison with other Danish institutions DIAS has a good performance in relation to technology transfer via its commercialisation of research results, and the DIAS Performance Contract 2005-2008 includes specific performance requirements concerning innovation and technology transfer in the form of 7 reported commercialisation cases, 4 patent applications, 5 licence agreements and 1 spin-off activity per year.

Since 2000 DIAS has employed staff to work exclusively with technology transfer, and a Patent Committee has been appointed. This committee is responsible for the evaluation and continuation of reported patent cases from scientists with a view to news value analyses and market surveys, etc. On several occasions DIAS has accomplished scouting in all departments in cooperation with one or more external innovation environments such as Østjysk Innovation A/S, Agro Business Park A/S, Syddansk Innovation A/S and NOVI A/S.

At DIAS's request the social benefits of 9 selected research projects within the areas of animal husbandry and vegetables, respectively, have been analysed in a report by Kvistgaard Consult, 2003. The analysis was not particularly aimed towards regional benefits, but rather towards general social benefits. The overall conclusion was, that the research performed in the selected departments demonstrated significant potential benefits to society in the form of specific quantitative economic and environmental effects, as well as more qualitative effects.

The socio-economic profits of the projects were evaluated according to traditional investment/economic indicators. The projects demonstrate internal average interest/return rates of 33 %. Even if the project yielding the highest interest rate is removed, the remaining 8 cases are able to yield present values of DKK 140 million. Six of the projects in the analysis demonstrated internal interest rates comparable to those found in surveys of internal interest rates in international agricultural research (Kvistgaard Consult, 2003).

The CVM patent is the most successful DIAS invention so far.

#### **CVM patent**

The cattle disease Complex Vertebral Malformation (CVM) is caused by a genetic mutation. The CVM patent: a DNA-based test used to identify cows, which carry the CVM gene, before they are used for breeding purposes.

The patent yields a considerable economic return to producers, suppliers and society.

The sale of rights – primarily to foreign countries – has been calculated to constitute approx. 9 million DKK.

The patent is owned by DIAS and the cattle breeding association "Dansire", and has been developed in cooperation between DIAS and The Danish Cattle Federation.

### Efforts in the form of a new Tech Trans project

In 2005 DIAS has – as part of its efforts within this area and in cooperation with the Agro Business Park – applied for and also received an appropriation from the Ministry of Science, Technology and Innovation to be used for a 4-year project on development and testing of new technology transfer concepts.

The project is characterized by comprising the entire process from the creation of an idea via research to patenting and the sale of rights to companies or establishing new companies. The project concentrates on 8 areas of efforts; areas in which DIAS has core competences including:

- Seed technology
- Genes and breeding to prevent diseases
- Molecular farming
- Sensors and equipment for precision farming in stables
- Sensors and equipment for precision farming in fields
- Technologies for improved feed utilization
- Manure treatment technologies
- Technologies in relation to plant medicine and human nutrition.

For each of these areas selected DIAS scientists will be matched with selected companies and industrial organizations, and these forums should be further educated in and used for generating ideas and technology transfer.

The intentions are partly to direct and increase scientists' focus towards the possibilities within research-based inventions, and partly to increase company knowledge of DIAS core research areas in order to establish targeted research projects aiming at the solution and patenting of inventions within specific or general problematic.

The project provides excellent opportunities for strengthening the regional perspective of DIAS cooperation with industries and companies and corresponds very well to other DIAS efforts concerning company cooperation such as The Science and Enterprise Network, as well as the wish of a strategic prioritising of the innovation area.

### Agro Business Park A/S

DIAS was one of the initiators behind the creation of the innovation environment Agro Business Park A/S, founded in 2000. Among the shareholders are DLG, DDH Consulting A/S (Det Danske Hedeselskab), a number of banks, innovative environments, and investment companies, as well as Viborg County and Viborg Trade Promotion Board.

The Agro Business Park is located close to research centre Foulum, and is a very important partner to DIAS, e.g. in relation to spin-off activities.

The main task for the Agro Business Park is the provision and dissemination of knowledge as well as expert advisory service to new companies within the areas of agriculture and food. Today about 20 companies and projects are located at the Agro Business Park. 4 of these originate directly from DIAS. A little less than 80 % of the Agro Business Park potential has been exploited. In August 2005 an innovation fund was established – Agro Business Innovation A/S – with the purpose of investing in special company projects.

Examples of spin-off companies originated from DIAS:



- Sorbisense – based on a patent – develops and produces new products for environmental monitoring.
- Conterra – develops and offers GPS applications.

During the interviews with the Agro Business Park and Østjysk Innovation A/S – another DIAS cooperation partner – the following considerations were made:

Great expectations are attached to the abovementioned new Tech Trans project at DIAS regarding company contacts and handling of patents, but at the same time DIAS is encouraged to be less formal and cautious in relation to establishing companies, and also to introduce rapid and more flexible procedures in relation to these. DIAS is further encouraged to consider possible alternatives to patents in cases where this seems relevant. According to the interviewed innovation environments "an institution like DIAS should be able to generate much more industrial and commercial activities".

According to the interview persons "Denmark is, generally speaking, characterized by having a wage-earning culture, and Danish scientists do not generate significant spin-off activities". It was suggested that DIAS should establish a "DIAS Consult A/S", partly to act as a fundraiser and partly to engage in commercialisation. If employed advisors were in charge of this, the scientists would be allowed to concentrate more on scientific issues.

Today some companies make important profits, and DIAS is encouraged to exploit such cooperation opportunities. It is noticed that DIAS has significant advantages compared to the universities regarding company contacts, as DIAS is familiar with close industry contacts.

### ***Industrial PhD and postdoc positions (in cooperation with private industries)***

The Department of Genetics and Biotechnology has a long tradition of industrial PhD students in cooperation with the cattle industry, and at present a PhD position is being prepared in cooperation with the company of Lattec I/S. Industrial PhD's are mainly cooperation projects with industry sectors or major cooperative companies.

The Department of Food Science has had a very successful industrial postdoctoral cooperation with the egg powder company "Sanovo A/S". During the process the company changed from merely being a production company to being a company with development of products. The cooperation is continued through further projects.

It is the department's opinion that an industrial postdoctoral position is more useful and applicable than an industrial PhD, as it gives you more freedom to decide concerning study plans etc.

### ***Dissemination of research results***

DIAS dissemination activities:

- International articles are published in recognized scientific journals
- The website [www.agrsci.dk](http://www.agrsci.dk) including electronic newsletter in Danish and English
- DIAS reports with scientific contributions
- "Grøn Viden" – popular communication
- Contributions to written and electronic news communication
- "Pl@nteInfo" a web-portal [www.planteinfo.dk/](http://www.planteinfo.dk/) in cooperation with The National Centre

- [www.kvaegforskning.dk](http://www.kvaegforskning.dk) and the publication "ny kvægforskning" in cooperation with The National Centre and The Danish Cattle Research Centre
- Open-house and field day arrangements at the five research centres and at the experimental stations
- Visitation service at research centre Foulum with 5000-6000 visitors a year from associations, companies, education institutions etc.
- Conferences, exhibitions, thematic days, workshops, lectures and educational activities
- Plant breeding conferences in cooperation with The Danish Agricultural Advisory Service
- "Scientist for a day" for pupils arranged by the Communication Centre in cooperation with DIAS' scientists
- "Twenty-four Hours of Research" an event where the research centres participate in cooperation with the municipalities.

In addition, information on DIAS research is disseminated via the web sites of the knowledge centres i.e.:

- Knowledge Center for Biomass and Manure Treatment Technology: [www.manure.dk](http://www.manure.dk)
- Danish Cattle Research Centre: [www.kfc-foulum.dk](http://www.kfc-foulum.dk)
- The Danish Research Centre for Organic Farming: [www.foejo.dk](http://www.foejo.dk)

#### 4.6 Evaluation of strengths, weaknesses, opportunities and threats

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>- High international research level in research areas matching regional industrial and social interests</li> <li>- Scientific core competences of significant importance to society</li> <li>- Strong national and international scientific alliances and many networks</li> <li>- Unique facilities</li> <li>- Central bridge building roles</li> <li>- Familiar with industrial contacts</li> <li>- Complementarity in relation to universities in Jutland Funen ago.</li> <li>- Specific efforts in relation to technology transfer and innovation</li> </ul>	<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>- External interest in increased cooperation</li> <li>- Application of unutilised competences and facilities</li> <li>- Increased emphasis on regional innovation</li> <li>- New incentives for cooperation with companies</li> <li>- Establishing further mechanisms for fundraising and commercialisation</li> <li>- Contract research/ binding strategic cooperation</li> <li>- More industrial PhD's</li> <li>- More active dissemination of research results</li> </ul>
<p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>- Some uncertainty concerning distribution of roles</li> <li>- Economy</li> <li>- Slow decision-making process</li> <li>- DIAS is not sufficiently visible</li> <li>- Competences and facilities are not fully utilized</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>- Economy</li> <li>- Industry performing their own research</li> </ul>

## 5. Education, labour market and qualifications

### 5.1. The regional dimension in education and training

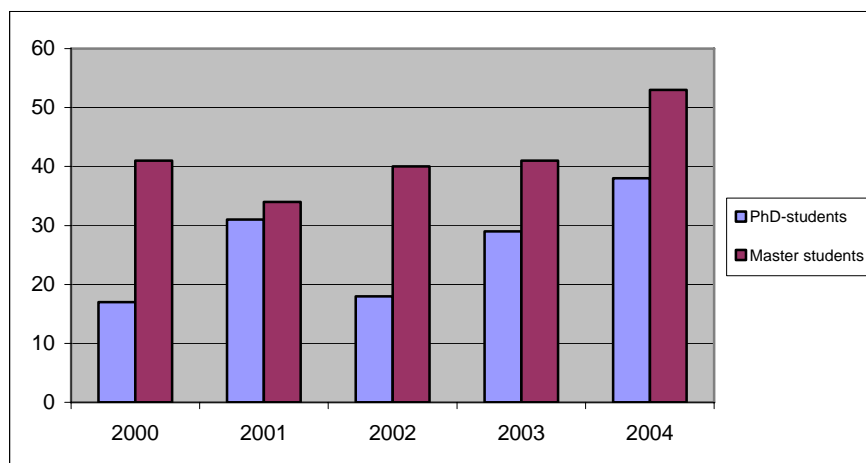
In its capacity as a research institution, the central tasks of DIAS are research and the provision of expert knowledge and advice to authorities and society. In addition, DIAS contributes to higher education. DIAS does not have its own educations and – as a consequence – DIAS has no permanent students for a longer period of time.

However, DIAS has always participated in educational activities – primarily higher education – in cooperation with Danish or foreign universities; i.e. further education in relation to areas, in which DIAS possesses special expertises, as well as thesis guidance at graduate and PhD level. To this should, to a minor extent, however, be added vocational training within relevant scientific areas. Some educational activities are performed in relation to regional education, although the decisive factor will always be an obvious scientific relation to DIAS's research areas.

In 2004 DIAS applied more than 6,000 hours in university education and contributed to the finishing of 38 PhD's and 51 master theses. The numbers of PhD's and masters during the last 4 years appear from fig. 3. In addition, DIAS acted as an external examiner in relation to 196 master- and bachelor theses, PhD theses and dissertations, and participated in 81 evaluation committees regarding the appointment of scientists, senior scientists, masters, lecturers and professors. At the moment DIAS has binding agreements with universities concerning research and education, and DIAS participates in a series of research schools for future scientists.

*Fig. 3*

*Number of accomplished and finished PhD's and Masters at DIAS in the period 2000-2004*



In the future DIAS's educational role will be given higher priorities, and DIAS will have to dedicate significantly more time to education in cooperation with the universities. A new appointment structure and formal agreements with the universities are both factors expected to provide an obvious framework for – and incentives to – the attention of educational tasks. As part of a competence development project for scientist courses in pedagogic and guidance are accomplished. The evaluation shows that DIAS possesses an unutilised potential regarding the role as a regional supplier of knowledge within specific scientific areas, but the necessary financial arrangements between DIAS and the educational institutions are still not settled.

The regional industrial characteristics correspond very well with the DIAS research profile – both in general terms, and also more specifically in relation to the regionally located centres. Examples of educational cooperation with a regional relevance:

- Research centre Aarslev provides education for students at the Department of Chemistry, SDU
- Students from Funen Business Academy, and College of engineering and education centre Dalum often accomplish study projects at research centre Aarslev
- Research centre Bygholm cooperates with Aalborg University regarding education of engineers, and with the Vitus Bering Denmark Institute on study projects within agricultural engineering with the participation of companies
- Research centre Bygholm has a joint professorship with SDU, and provides education in "Animal Waste Engineering"
- Research centre Foulum cooperates with the University of Aarhus, Aalborg University and SDU concerning e.g. scientific "packages" in relation to education, theses and PhD studies within biological, genetic, technical and environmental areas
- Department of Genetics and Biotechnology gives lessons in fur breeding at Asmildkloster Agricultural College
- Department of Food Science contributes to a PhD-study in cooperation with the University of Aarhus, the Swedish University of Agricultural Sciences and the food company "Danisco"
- Surgeons from regional hospitals use the animal operation facilities at research centre Foulum for educational purposes.

A significant motivation for engaging in educational activities is the improved possibilities of recruiting competent master- and PhD students. Recent years have witnessed a spread in the recruitment basis, for instance implying that biology students from the University of Aarhus carry out PhD studies in areas, that traditionally belong to horticultural graduates.

Applying a broader learning perspective, many effects of DIAS research and dissemination will appear at conferences, meetings and courses, as well as by virtue of articles, the DIAS website and frequent appearances in the media. This may be characterized as a wide-ranging transfer of knowledge from research to business, industry and society as a whole.

The three DIAS centres in the region actively participate in popular public-oriented dissemination of research such as "Twenty four Hours of Research" a new initiative from the Ministry of Science, Technology and Innovation in the spring of 2005. Debates were held at science cafés, and illustrative stands were established in nearby cities. Municipalities, trade promotion boards etc. strongly supported the arrangement, which will most likely be an event recurring each year. The annual open-house arrangements further contribute to provide the public with an introduction to research.

Furthermore, the fact that DIAS attracts a considerable number of international visiting scientists, PhD students etc. is of significant importance to the region. DIAS has guest housing facilities, and plays a central role in welcoming and integrating foreign colleagues.

Finally it should be mentioned that DIAS currently contributes to the education of trainees within DIAS's own technical and administrative fields of work.

## **5.2. Student recruitment and regional employment**

The above-mentioned educational cooperation with universities, high schools and vocational schools presumably has a positive effect in relation to the maintaining and further development of regional educational provision and student recruitment within the areas of interest to DIAS. However, it seems rather difficult to document this assumption, and in general terms DIAS's contribution to education is relatively modest.

During the preparation of this study, the Danish government has appointed a committee with the purpose of considering the possibilities for an increased cooperation between DIAS and the Royal Veterinary and Agricultural University in Copenhagen. The Jutland-Funen regions closely follow the results of the committee efforts. The present evaluation indicates that there is a strong wish in Jutland and Funen to be able to offer improved agricultural education – in the region – at university level. It is not yet possible to evaluate whether this is best realized by means of a merger or through other cooperation models, such as e.g. between DIAS and regionally located universities.

One of the ideas behind the establishment of the Agro Business Park was to support graduates starting their own companies – in DIAS's case based on inventions with promising perspectives and created as a part of research. Several excellent examples of company establishment exist, that are essential to regional employment perspectives.

Regional employment conditions in the agricultural sector form part of the regional industrial councils and county evaluations of labour market needs and development possibilities at county level. No specific areas of shortage or surplus capacity have been identified in the survey, and DIAS does not actively participate in this type of considerations. There is one exception, however, in connection with major staff adjustments DIAS informs the regional industrial councils about the number of dismissed employees, as well as the scientific areas of these. It is then for the regional labour market authorities to decide on – and contribute to – readjustment and re-employment, preferably in coordination with DIAS efforts.

## **5.3. Encouraging lifelong learning, continuing development and training within agricultural professions**

In several ways does DIAS contribute to lifelong learning within the region, partly for professional users of research results such as advisors, farmers, gardeners and fur farmers, and partly for a broader part of society, not least for high schools and vocational education, as well as for teachers at these institutions. Cooperation relations involve networks between research- and educational institutions, and may thus contribute to the generating of new ideas and projects across sectors.

The Danish government has decided to strengthen the efforts in relation to rural district development, and also to make it more attractive to live in rural districts. Strategy elements comprise knowledge-based industrial development within e.g. food production, as well as an improved nature management. DIAS has excellent opportunities of entering into cooperation relations in relation to joint projects, in which both companies, municipalities and citizens will benefit from research-based knowledge, e.g. in connection with niche productions and rural district development.

#### 5.4. Changing forms of educational provision

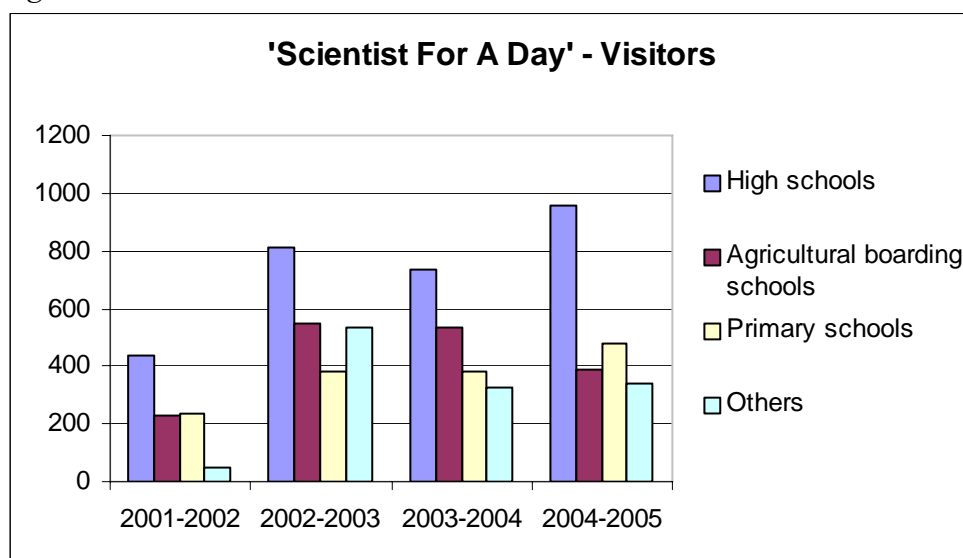
Some DIAS departments work with IT-supported learning processes, for instance courses at PhD level within genetics and biotechnology and e learning for farmers.

A Communication Centre for Natural Science and Agriculture located at the Agro Business Park makes it possible for pupils in primary schools and high schools to be "Scientists for a day" with scientific syllabus-related activities in the research departments at Foulum and Bygholm, as well as to participate actively in the "dynamic dissemination of research results" concept, where the research process can be followed online while it is still in process. The initiative has a national perspective, but enjoys particular interest from schools in nearby counties.

The purpose of the Centre is to provide experiences with and knowledge of Danish agriculture, the necessary interaction between an efficient and profitable agricultural production and a sustainable and recreational well-functioning natural basis. The Centre contributes essentially to the pupils' knowledge of agricultural science, as well as to the motivation and decision-making when it comes to choosing a future education. In Denmark it is regarded as critical, that relatively few young people apply for admission to higher education within natural science.

After a trial period under the name of "Farm4U" a broader group now supports the centre: DIAS, KVL, Viborg County, The Danish Agricultural Council and The Danish Agricultural Advisory Service, the National Centre, AU, AAU, SDU and The Danish Outdoor Council. Cooperation relations have been established with SDU concerning pedagogical research in the special extra mural and authentic learning methods practised by the centre. In this connection the extensive experimental facilities at DIAS constitute a major strength. From fig. 4 it appears that the major part of participants in "Scientist for a day" are high school students. The evaluation shows that pupils, teachers and the participating scientists are very satisfied and pleased with this initiative.

Figure 4.



(Source: Communication Centre, 2005)

#### 5.5. Enhancing the regional learning system

The evaluation demonstrates an increasing attention and interest in regional cooperation in order to make DIAS participate even more actively in the development of a comprehensive regional learning system, and thus hopefully promote employment possibilities. In connection with the structure reform new regional growth forums will be established in order to initiate and coordi-

nate regional political initiatives in relation to industrial and labour market issues. DIAS participates in various industrial-political associations and councils.

The Jutland-Funen Business Cooperation Scheme supports the promotion of contacts between companies and scientists. Based on this DIAS and the universities in Jutland-Funen participate in "The Science and Enterprise Network", which is used by regional companies and actors within regional industrial promotion. The Science and Enterprise Network offers guidance to companies and advisors, and help them locate the most relevant research environments and become familiar with individual scientists and their fields of effort. Interviewed industrial promotion actors believe that there is a significant need for this type of bridging, and thus also the possibility of creating learning, sharing of knowledge and joint activities for the mutual benefit of all parties.

As a major institution DIAS has considerable activities within the field of supplementary education for DIAS employees. There is close cooperation with regional educational institutions regarding standard, as well as tailored courses and education projects. A specific project on supplementary education and readjustment was accomplished in the Department of Farm Management and Research Facilities. This initiative has achieved the status of a State model project, and has been evaluated by The Centre for Development of Human Resources and Quality Management. At present another example is planned as an experimental project on integration of foreign colleagues (language and culture). This project will presumably be co-financed by the EU.

## 5.6. Evaluation of strengths, weaknesses, opportunities and threats

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Scientific profile matches very well with regional needs</li> <li>• Broad cooperation contacts – especially to universities</li> <li>• Education is an active means of recruitment</li> <li>• Many positive experiences and examples</li> <li>• Courses in pedagogic and guidance have been initiated</li> <li>• Broad knowledge transfer to industry and society</li> <li>• Communication centre activities</li> <li>• Attracting foreign scientists</li> </ul>	<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Significant external interest in increased cooperation</li> <li>• Increased cooperation with KVL and other universities</li> <li>• Regional supplier of knowledge and bridging in relation to international knowledge production</li> <li>• New act emphasizes increased activities</li> <li>• Increased emphasis on IKT-supported education</li> <li>• Increased emphasis on lifelong learning and education</li> </ul>
<p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Lack of economic agreements with universities</li> <li>• Lack of incentives to engage in education activities</li> <li>• Lack of pedagogical competences of some scientists</li> <li>• Only a loose connection to regional education systems</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• National and international competition</li> <li>• Less room for research</li> </ul>

## **6. Social, cultural, socio-economic and environmental development**

### **6.1 Social development**

By means of its size alone, DIAS is a very important work place in the various parts of the Jutland-Funen region, in which institution activities are located. This is particularly the case in relation to research centre Foulum, but also the centres in Bygholm and Aarslev are considered by municipalities and counties to be very important elements of the overall profile in relation to industry, labour market and education.

As a consequence of the above, DIAS has a significant direct, as well as indirect, influence on employment, welfare and social conditions in the region. The major part of the DIAS employees has settled in the region, and it is the general impression that many DIAS employees are very active participants in local associations, organizations and local politics. Most DIAS employees have a fairly high level of education and according to some of the interviewed persons this fact further contributes to regional involvement and an increased diversity within the local communities.

Local cooperation has facilitated the access to DIAS facilities in selected fields, just as increased cooperation has been established within social and health related areas of relevance at both local and regional level. As examples of this the following should be mentioned: DIAS's participation in local partnerships with public authorities and private companies within the so-called "broad labour market", a regional partnership dedicated to make the region more attractive to highly educated employees called "Double careers", a network trying to improve the welcoming procedures and integration efforts in connection with foreign employees and ethnical minority groups, close scientific cooperation between local hospitals and DIAS regarding operation facilities with a view to improving surgeon competences, and finally considerations as to equality and social conditions when making research project applications to the EU.

The DIAS staff- and management policies emphasize social responsibility, diversity, as well as a flexible approach towards participating in socially oriented initiatives. In this connection DIAS has an extensive cooperation with local public authorities concerning the prevention of working environment problems, the retaining of employees in case of illness, as well as integration of unemployed citizens via job training, vocational training etc. DIAS has a number of employees in flexible job positions, which are usually established in order for an employee to keep his/her job despite serious health problems.

DIAS's economic situation, as well as the increasing emphasis on efficiency and focusing, may be a barrier, but DIAS would like to strengthen this particular area by means of specific agreements, as well as participation in informal local networks, which seem relevant to the possibilities of the individual centres to contribute to the solution of social issues.

### **6.2 Cultural development**

Every year all the DIAS research centres host Open-house arrangements for all who are interested in DIAS's activities. Admission is free at these arrangements. In addition, various groups such as farmers associations, educational institutions, agricultural thematic groups, retired persons etc. visit DIAS on a current basis.

A few sports activities are arranged at DIAS, and the institution has previously participated in e.g. local company sports. DIAS contemplates the establishment of a staff club, and in this con-



nection wishes have been expressed as to increased possibilities for sports activities, and the DIAS security committee considers new health promoting initiatives.

In connection with building and reconstruction considerable sums are earmarked for the purchase of art, often created by local artists. Add to this the fact that DIAS often receives funds for special works of art. Works of art are exhibited at all DIAS centres, and these constitute an important and positive part of the institution's working environment. Additionally, some departments have their own art associations, which arrange alternating art exhibitions, mainly by local artists. DIAS occasionally arranges events as to the unveiling of works of art; this further contributes to profile the institution and render it more visible. The public unveiling of a new sculpture is scheduled to take place at the end of 2005.

In this cultural sense DIAS contributes to encourage artistic production, as well as the cultural layers of growth, but in a broader sense DIAS is not particularly active. This may be a potential development area.

Many foreign scientists are employed at DIAS, either as visiting scientists or more long-term employments. These employees also contribute to an increased multiplicity in local areas.

### **6.3 Environment and sustainable development**

A major part of the DIAS research deals with – or is relevant to – environment and sustainability, and it is a part of the institution's purpose to encourage environmentally sustainable solutions within agricultural production and general social development.

Based on this there are many examples of cooperation between the research departments at DIAS and regional/local authorities, companies etc. The cooperation between DIAS and the counties in relation to the protection of the aquatic environment, and the balance between agricultural and environment considerations, is very central. Therefore, DIAS is known in the region as an important research and development actor in the environmental area.

Environmental issues are often on the agenda in connection with visiting scientists, students and citizens, as well as in connection with the general scientific dissemination of research results at the DIAS website, and in the form of popular scientific publications. Thus, DIAS contributes actively to the development of knowledge in relation to environmental conditions and the provision of solutions to environmental problems in the region.

DIAS's own impact on nature and environment constitutes an essential element when new buildings are contemplated, as well as the running of these. A high aesthetic/architectural standard is ensured when making extensions, with due consideration to the impact on landscape culture and values. Some DIAS buildings are worth preserving, and the maintenance standard is high. DIAS therefore appears as a distinctly positive example in relation to the impact of buildings and gardens on the surroundings – partly in the open land areas and partly in the few cities, in which DIAS has activities.

Every year DIAS prepares "green accounts" measuring a series of parameters of importance to the institution's use of resources, and thus also to the operational impact on the environment. Based on these green accounts environmental initiatives are currently implemented such as reducing energy consumption, handling of harmful waste, reduced consumption of paper etc.

#### **6.4 Socio-economic development**

As previously mentioned DIAS is essentially important to the socio-economic development in the region, especially in the local areas housing the activities. The DIAS research centre Foulum is presumably the most distinct example of a major state institution being moved from the metropolitan area to the Jutland-Funen region, and the move was considered to be important and well-organized, thus demonstrating that it is possible to move public working places from the Copenhagen area to Jutland, and that it may be successfully performed.

Such a move results in the creation of more jobs, students, increased settling in rural districts, increased taxation base and an improved potential for industrial development based on a high level of education and knowledge. One of the interviewed key persons has the opinion that DIAS employees strengthen a sort of "creative class" in the local areas. Another interviewed key person says, that the local citizens are "proud to have such a large institution", and that "DIAS ensures a better agricultural profile in the region".

Improved local employment opportunities within research and development are supposed to strengthen the orientation of various social groups towards this, especially within agricultural research, as this is well connected to the regional/local industrial structure. The location of DIAS seems to positively increase the awareness of natural science among high school students, university students and agricultural industrial companies. An excellent example is the fact that many of the students participating in "Scientist for a day" are very surprised to learn about the variations of agricultural research, and in particular that the research also includes broad comprehensive themes such as environment, health and animal welfare. They achieve an increased understanding of agricultural conditions, and realize that it is not solely about efficiency, but also about balancing between production and environmental consideration, as well as cautiousness and responsibility when applying new production methods and technologies.

DIAS depends on good and well-functioning regional framework conditions in relation to employees, attractive settling opportunities, transportation and educational possibilities both in general terms and within relevant scientific areas. This is most often the case, and DIAS has in general no particular problems in this area.

There are, however, significant challenges connected to the location of DIAS, especially in relation to attracting and retaining employees of a high international educational level from major university cities. When issues such as employment for the spouse, location in a rural district and a relatively small international environment are considered, it is more difficult to attract specialists – other things being equal. By means of cooperation DIAS actively tries to solve this kind of problems, and has its own guesthouses and runs a student hostel, but in the future there will be a need for addressing these issues and most likely new initiatives may be necessary.

## 6.5 Evaluation of strengths, weaknesses, opportunities and threats

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Major local enterprise</li> <li>• Social responsibility</li> <li>• Supports local artists</li> <li>• Develops environmentally sustainable solutions</li> <li>• Positive example as to nature and environment</li> <li>• Visiting scientists contribute to an international research environment</li> </ul>	<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• To work for increased dynamics in the area via innovation</li> <li>• Improved facilities for visiting scientists and their families</li> </ul>
<p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Economic limitations</li> <li>• Relatively small international research environment</li> <li>• Limited facilities for visiting scientists' families</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Future recruitment problems</li> <li>• Increased efficiency may weaken social responsibility</li> </ul>

## 7. Contribution to regional capacity building

### 7.1 Mechanisms promoting research and the regional orientation of education

The DIAS sub strategy aiming at the development of regional cooperation in relation to the regionally located research centres is in line with the strategies and wishes expressed by the counties and municipalities in question regarding regional development.

The Viborg County has a strong desire to take initiatives to prevent the depopulation of the area, and as DIAS especially in the last years has been increasingly open and positive in this respect the scene was set for closer cooperation. The major importance of agriculture and food production to the employment in Viborg County – and the focus of the county on DIAS's role within this sector – have both been factors initiating such a process.

DIAS has been included in county and municipality strategies, and formal, as well as informal meetings are regularly arranged between county and municipality employees, politicians and leading DIAS employees. These relations have – together with joint initiatives – contributed to enhance the dialogue, as well as to identify existing needs, and an excellent connection exists between these initiatives and the wish to achieve an increased industrial development.

Viborg County readily puts resources at DIAS's disposal in connection with the County office in Brussels with a view to making EU contacts, just as Viborg County and Viborg Municipality contribute some share of funds to joint initiatives.

The stability of the mutual engagements is ensured by means of the existence of written agreements. Regarding the Agro Business Park 3 or 4-year development plans are prepared. Likewise, "The Knowledge Centre of Manure and Biomass Treatment Technology" will be closely monitored.

Viborg County was the initiator of the Dynamo project – "Agriculture Used as a Dynamo for a Sustainable Development in the Rural Districts", in which the County, DIAS and the Agro Business Park have acted as a monitoring group guiding and stipulating guidelines for a series of sub projects with the purpose of upgrading local companies and improving their ability to utilize the

knowledge. The EU funds supports the project, and regional development funds contribute to a broad development of competences.

Surveys and plans for industrial development (including links to different sectors) are prepared for Viborg County. There are, however, no surveys as to existing academic knowledge in the area or to the distribution of this. At present it is considered whether or not this area should be given higher priority.

Viborg County realizes the importance of directing its focus towards supporting local industrial promotion actors acting as bridge-builders in relation to small companies, as well as supporting actual development projects.

In connection with "The Science and Enterprise Network cooperation" DIAS has initiated cooperation relations with TIC Viborg, but actually DIAS could make much more use of local trade promotion boards to make contacts to companies and to discover their needs. It is also possible to participate in the initiatives "Compass" and "Rent a Boss", or to "share" a PhD student with a trade promotion board within, e.g., the field of working environment.

In spite of all the entrepreneur initiatives and all county and municipality efforts to refer entrepreneurs to the Agro Business Park (which has approved establishment advisors), too few people with a higher education establish a company.

The Director of Viborg trade promotion board is the chairman of the trade promotion boards in Denmark, and he is preparing a plan for industrial development in Denmark. This plan is supposed to be finalized before the end of 2005, and ready to be used in the new municipalities. The vision draft is far-sighted and DIAS is mentioned.

The new "growth forum" for the region of Mid-Jutland will be an expert panel for the trade promotion board of Mid-Jutland, and Viborg County expects that DIAS will play a central role in introducing agricultural research to the industrial dialogue. DIAS is considered being a central unit to be maintained and further developed, and the new Mid-Jutland region is expected to be an excellent cooperation partner for DIAS.

The University of Aarhus, major companies in the area, Aarhus County and the Municipality of Aarhus have established a nano-technology consortium in which DIAS participates in relation to food. The consortium has initiated a think tank to evaluate the effects for a 3-year period. The interested parties are very engaged and support the centre financially.

Via its research DIAS is very visible also in Funen County, and plays an important role to the Jutland-Funen development, and the Jutland-Funen counties have contributed to the strengthening of this development. Funen County and the Municipality of Odense have granted considerable sums to new regional initiatives, as well as to institutional cooperation in the region. Horticulture is one of four areas of increased efforts under the so-called "The 4Frontregion" – a regional development plan coordinated by a secretariat – concerning regional involvement in Funen County. DIAS and Development Center Aarslev both participate as central actors in this project. Funen County, however, regards it as a weakness that DIAS – as a public sector research institution – do not have educational activities, to a larger extent, and considers education to be a development area for DIAS.

In relation to the achievements within the field of "Plants for Health", Funen County has initiated the TCM Consortium. The consortium secretariat is located at The Funen Enterprise Develop-

ment Center, which has the necessary commercial background and experience. Cooperation agreements have been made with Chinese authorities with a view to becoming a strategic partner in relation to "traditional Chinese medicine". The DIAS centre at Aarslev is an active partner in the building of the relations in China.

Funen and the KERN region in Northern Germany have initiated a EU Interreg. project, in which Development Center Aarslev cooperates with the University of Kiel.

DIAS forms part of the regional industrial development process in Funen County and participates in formal cooperation forums. Furthermore, leading DIAS employees are invited to participate in activities targeted towards industry, in which they meet with company managers and other key persons involved in regional development.

Thus, the mechanisms ensuring regional development are agreed upon with the obvious intention of making "Plants for Health" a business area for Funen.

In recent years a significantly closer contact and dialogue has been established between the municipality of Horsens and the DIAS centre at Bygholm. In 1999 – 2000 Horsens Municipality revised its industrial policy, and in relation to this the importance of the agricultural sector was emphasized. As a consequence, the municipality and a series of central actors created the Agricon Valley Network.

Research Centre Bygholm, Vitus Bering Denmark and Horsens Municipality established Innovation Horsens (a part of Horsens Commercial Council), which supports entrepreneurs and newly established companies in realizing ideas and providing venture capital. At present there are no agricultural projects, but the framework is available for coming sustainable ideas.

## **7.2 Regional dialogue and marketing**

The following joint marketing initiatives should be mentioned:

- Agro Business park, the Dynamo project, and The Knowledge Centre of Manure and Biomass Treatment Technology in cooperation with Viborg County
- Development Center Aarslev, with Funen County.
- Communication Centre, "Scientist for a day" (Viborg-Tjele trade promotion board, Viborg County etc.),
- "Twenty four hours of Research", initiated by the Ministry of Science, Technology and Innovation (municipalities of Viborg and Tjele, Horsens municipality etc.)
- The Science and Enterprise Network with the counties in Jutland and Funen.

DIAS has dedicated staff to be in charge of contacts, in connection with The Science and Enterprise Network, in connection with the newly established Technology Transfer Project, and in connection with the Knowledge Centre of Manure and Biomass Treatment Technology.

Image and visions are important in relation to attracting industrial development, and counties and municipalities are expected to bring their image and visions to the new Danish regions and municipalities.

Still, regional impact can never be predicted, nor do visions prove correct in all cases. Successful commercialisation and industrial development constitute the incentives to maintain the visions and the activities behind.

### 7.3 Mapping and evaluation of the regional impact of research and education

In recent years DIAS has had a series of major user studies made, e.g.:

- In relation to providing expert advice to public authorities (Kvistgaard Consult, 2001)
- Among cooperation partners (Kvistgaard Consult, 2000)
- Concerning statutory variety testing (Kvistgaard Consult, 2001)
- Among agricultural advisors within primary production (GfK Danmark A/S, 2000).

The user studies all have a national aim, but have included regional users. The general conclusion of the studies are that the users of DIAS research and facilities have been very satisfied with the cooperation, but they have also pointed out a series of improvement suggestions, which DIAS has acknowledged in order to improve relations and to increase the utility value of the interactions. It is a part of the DIAS Performance Contract to perform user studies at regular intervals.

DIAS considers the planning of the regional merging of counties, as well as the new structural reform, which is very likely to be of significant importance to future cooperation.

DIAS is – via its main centre in Foulum and the centre at Bygholm – together with the University of Aarhus, as concerning research activities, located very centrally in the future Mid-Jutland region. DIAS considers it to be an obvious advantage, that Viborg will be the principal regional city, and expects that regional efforts will be more pronounced. Regarding technology transfer and innovation cooperation DIAS's natural and primary partners will be the innovation environments Agro Business Park, "Østjysk Innovation A/S", and NOVI.

The DIAS centre in Aarslev will be located in the future region "South" together with The University of Southern Denmark. It is regarded as a very positive sign that Funen County wishes to include the present visions for horticulture and "Plants for Health" in the new region.

There is a strong synergy between e.g. the goals of Viborg County – and of the future region, respectively – and of DIAS regarding biomass problematic, rural district problems and industrial development, and also the goals of Funen County in relation to the horticultural industry and "Plants for Health". Differences exist in the schism between regional and national issues of DIAS's research focus.

The counties are well aware that DIAS has a national research engagement to be considered first and foremost. However, the counties also think that DIAS should be regionally rooted and well established.

Regional aspects may be of increasing future significance if regional interested parties and institutions will be able to act together. An incentive for DIAS to be more regionally involved – at various levels – is an increased regional application of DIAS's competences, as well as establishing a broader profile in relation to the food industry and rural districts in cooperation between DIAS, the region and the industries.

If, however, DIAS is involved too deeply in regional issues this may damage the scientific reliability of DIAS's national research. Also for the future the solid foundation should be international and national agricultural research, and within certain scientific areas with a very strong international position yielding regional and national returns.

At present regionally targeted funds such, as "the Science and Enterprise Network" and "the Rural District Development Funds" must not be used to finance research efforts. DIAS can only get access to these funds by means of advisory services or by means of network activities. International EU research projects are not (in themselves) a solution, but rather a part of the problem as considerable co-funding is required in relation to these projects.

A regional research fund may be an obvious means of promoting DIAS's regional involvement. Ringkøbing County has already established a fund for regionally oriented research purposes, and hopefully such inventive ideas may affect the decision-making processes in the future "growth forums" and may be introduced in the new regions and municipalities.

The lack of sufficient venture capital in relation to starting business activities in the Mid-Jutland region constitutes another corresponding problem. However, a private innovation environment – Agro Business Innovation A/S – has recently been established in relation to the Agro Business Park. The main purpose of this innovation environment is to improve the possibilities for successful establishment of new companies and activities, and this is a step in the right direction.

In order for DIAS to become a regional dynamo via ramifications such as knowledge centres, networks and spin-off activities, there is a general need for more dynamics. In case sufficient funding is placed at DIAS's disposal, a perfect platform for such a future development would be an increased future educational engagement – in close cooperation with KVL – as well as the resulting dynamic student environments at the research centres. In addition, this will enhance the ambition of DIAS to be a bridge builder – nationally as well as internationally – in relation to the universities in Jutland Funen– and this will definitely strengthen all the involved parties.

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## Enclosure 1. External and internal interview persons

### Supporting the Contribution of Higher Education Institutions to Regional Development in Jutland-Funen Sub report Danish Institute of Agricultural Sciences

#### External interview persons

Project manager	Finn Bendixen	Scientist for a Day, Foulum
Director	René Damkjer	Agro Business Park, Foulum
Head of Centre	Christian Børsting	Danish Cattle Research Centre (KFC), Foulum
Trade promotion officer	Bent Mikkelsen	Viborg County
Labour market officer	Hans Chr. Theut	Viborg County
Head of department	Henrik Brask Pedersen	Viborg County
Director	Erik Krarup	TIC Viborg
Trade promotion manager	Knud Erik Larsen	Viborg trade promotion board
Head of department	Erik Sejersen	Århus County
Director	Lars Stigel	Østjysk Innovation, Århus
Chairman	Henrik Refsgaard	Organic Denmark, Århus
Deputy managing director	Leif Herløv Nielsen	The National Centre, Danish Agricultural advisory service, Skejby, Aarhus
Business consultant	Charlotte P. Vest	Agricon Valley, Horsens
Rector	Hans Jørgen Hansen	Vitus Bering, Horsens
Chief executive	Niels Højbjerg	Funen County, Odense
Head of department	Rune Stig Mortensen	Funen County, Regional Committee, Odense
Director	Bjørn Pedersen	Funen Enterprise Development Centre, Odense
Head of department	Palle Møldrup	Funen Enterprise Development Centre, Odense
Head of department	Preben Stuhr Nielsen	Funen Business Academy, Odense
Advisor	Merete Rugager	Danish Association of Horticultural Producers, Odense
Chairman	Poul Thage Pedersen	Danish Association of Horticultural Producers, Odense
Manager	Rune Larsen	Robocluster, Odense
Head of centre	John Henriksen	Development Center Aarslev, Aarslev
Head of secretariat	Niels Maarbjerg Olesen	Aalborg University (AAU), Aalborg
Head of faculty	Erik Meineche Schmidt	Faculty of Science, University of Århus (AU), Århus
Head of faculty	Henrik Pedersen	University of Southern Denmark, Odense

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**Internal interview persons**

Research director	Jesper Waagepetersen	Dept. of Agroecology, Research centre Foulum
Head of research unit	Ole Hørbye Jacobsen	Dept. of Agroecology, Research centre Foulum
Head of research unit	John Hermansen	Dept. of Agroecology, Research centre Foulum
Head of research unit	Tommy Dalgård	Dept. of Agroecology, Research centre Foulum
Senior scientist	Uffe Jørgensen	Dept. of Agroecology, Research centre Foulum
Head of research unit	Iver Thysen	Dept. of Agroecology, Research centre Foulum
Research director	Svend Christensen	Dept. of Agricultural Engineering, Research centre Bygholm
Head of research unit	Svend Morsing	Dept. of Agricultural Engineering, Research centre Bygholm
Research director	Kirsten Jakobsen	Dept. of Animal Health, Welfare and Nutrition, Research centre Foulum
Head of research unit	Bent Borg Jensen	Dept. of Animal Health, Welfare and Nutrition, Research centre Foulum
Head of research unit	Hanne Damgaard Poulsen	Dept. of Animal Health, Welfare and Nutrition, Research centre Foulum
Head of research unit	Jan Tind Sørensen	Dept. of Animal Health, Welfare and Nutrition, Research centre Foulum
Head of research unit	Birte Lindstrøm Nielsen	Dept. of Animal Health, Welfare and Nutrition, Research centre Foulum
Head of research unit	Klaus Lønne Ingvarsten	Dept. of Animal Health, Welfare and Nutrition, Research centre Foulum
Forskningsprofessor	Knud Erik Bach Knudsen	Dept. of Animal Health, Welfare and Nutrition, Research centre Foulum
Research director	Just Jensen	Dept. of Genetics and Biotechnology, Research centre Foulum
Research director	Henrik Andersen	Dept. of Food Science, Research centre Foulum
Senior project scientist	Margrethe Therkildsen	Dept. of Food Science, Research centre Foulum
Senior scientist	Merete Edelenbos	Dept. of Food Science, Research centre Aarslev
Research director	Ole Callesen	Dept. of Horticulture, Research centre Aarslev
Senior scientist	Carl-Otto Ottosen	Dept. of Horticulture, Research centre Aarslev
Head of research unit	Lars Porskjær Christensen	Dept. of Horticulture, Research centre Aarslev
Deputy director	Ole Olsen	Board of directors

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Deputy director	Søren A. Mikkelsen	Board of directors
Director of personnel	Kjeld Lanng	Personnel unit, Administration

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