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Shaping Aquaculture Research!

Aquaculture Expert Forum

Strategy of the German Agricultural Research Alliance

Imprint

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Publisher
German Agricultural Research Alliance (DAFA)
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Editorial, content, concept
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Layout
N-Komm Agentur für Nachhaltigkeits-Kommunikation UG, Frankfurt

Pictures
Title: Wolgin/fotolia.de; 3dl: iStock; 3dr: Tobias Lasner, Thünen-Institute; 5u: eugenesergeev, fotolia.de; 5dr: Thorsten Michaelis, DAFA; 5dl: Thorsten Michaelis, DAFA; 6: Ulrike Hochgesand, Thünen-Institute: 7dl: Ulrike Hochgesand, Thünen-Institute; 7dr: Ulrike Hochgesand, Thünen-Institute; 8: Ulrike Hochgesand, Thünen-Institute; 9dl: LfL, Institut für Fischerei, Starnberg; 9dr: Malena und Philipp K., fotolia.de; 12: Ulrike Hochgesand, Thünen-Institute; 15: Alexander Brinker, LAZBW; 18: Uwe Brämick, IFB e. V.; 20: momius, fotolia.de; 23ul: Alexander Brinker, LAZBW; 23ur: Bela Buck, AWI; 23dl: Tobias Lasner, Thünen-Institute; 23dr: Tobias Lasner Thünen-Institute; 25: Wolgin/fotolia.de; 26: Ulrike Hochgesand, Thünen-Institute; 28: Katja Seifert, Thünen-Institute

Date 7/2014

The Aquaculture Research Strategy is also published as an electronic version on our website www.dafa.de/de/startseite/fachforen/aquakultur.html

ISBN 978-3-86576-144-6

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Executive summary

With this strategy, DAFA sets out how German research in aquaculture could be adapted to meet the future challenges. The strategy complements the German multiannual national strategic plan for the development of aquaculture activities.

Aquaculture is the global food industry's fastest growing sector. The quantity of farmed fish produced will soon exceed the output of wild fisheries.

The development of aquaculture in Germany has stagnated even though the country's water resources and technological capacity provide the foundation for a competitive sector. Germany now accounts for less that 0.1 % of global production. A number of barriers (including the legal framework and conditions that the sector operates in) contribute to this failure to realise potential.

The German aquaculture research effort has not given the sector the decisive boost required to overcome this stagnation and keep pace with global developments.

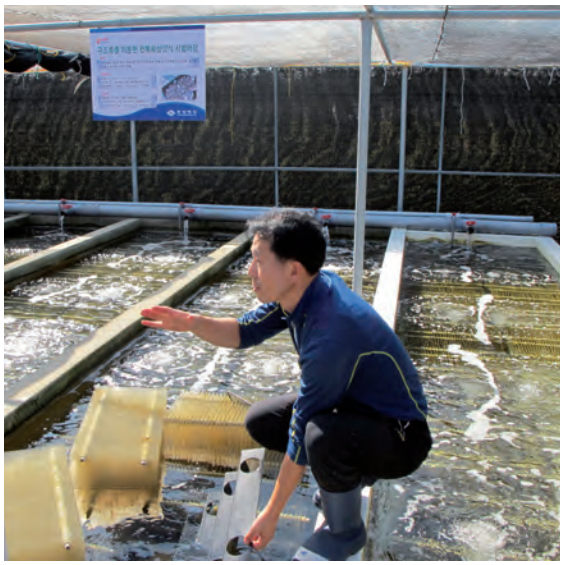
The strategy of the German Agricultural Research Alliance (DAFA) has two long-term objectives:

1. Aquaculture products consumed in Germany should promote human health, meet the highest food safety standards and come from sustainable production based on high animal welfare standards.

2. The German aquaculture sector should realise its full competitive potential.

Aquaculture research can only address these objectives when its resources are pooled and focused on key challenges. These key challenges (e. g. administrative barriers, sustainability assessment, economic competitiveness) can only be addressed if aquaculture research

The demand for fish grows continually and half of the fish consumed world-wide now comes from aquaculture.



About 90% of the aquaculture production is in Asia. Imports account for 80% of fish consumed in Germany.

develops innovative and practical solutions which are relevant. This applies to both the sought-after increase in production in Germany as well as to the sustainable production of healthy products that are traded internationally. Some central challenges will only be addressed adequately when the traditional natural sciences and technical strengths of the aquaculture research community are complemented by other disciplines (for example economics, ecology, environmental law and ethics).

A fragmented research community with 30 public sector research organisations (albeit many with very limited capacity) active in the field makes the pooling of effort and resources difficult. In addition, some fundamental questions about the future direction of the sector remain open: where does the German aquaculture sector have the potential to be competitive? How can limited research resources be best used to support the objectives set out above? How can the goals set out above be addressed with limited research resources?

To address these challenges as quickly as possible, DAFA has developed three core recommendations that are elaborated upon in this strategy:

Core Recommendations

I. Studies of potential and prospects

II. A collaborative project entitled "site-optimised expansion of aquaculture"

III. Development of a (virtual) German Aquaculture Centre

New approaches to research funding are required. Established research funding systems of the EU, German Federal Government and Federal States are welcome but it must be remembered that they have additional and wider objectives. They cannot substitute the funding measures called for here.

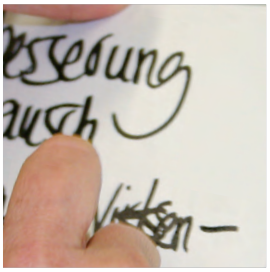
The discussion has resulted in the identification of three approaches that could be used to finance the proposed new arrangement of aquaculture research:

- Use of the future European Maritime- and Fisheries Fund (EMFF)
- The commitment of several German Federal Ministries (e.g. BMEL, BMBF, BMWi, BMUB) under the auspices of the Federal Bioeconomy Strategy
- A common strategy by several German Federal States

Aquaculture will continue to grow world-wide; in Germany the sector has stagnated.

Over 100 experts from the science, business, policy and research funding communities discuss in Hannover and Berlin how we can give a boost to German aquaculture.

1 Introduction



This report sets out DAFA proposals for how German research in aquaculture could be adapted to meet the challenges that lie ahead. The strategy complements the German multi-annual national strategic plan for the development of aquaculture activities.

The DAFA strategy aims to bring about a fundamental improvement in German aquaculture research. In order to address the core challenges of the sector, the traditional science and technology oriented research needs to be combined with other disciplines (e.g. economics, environmental law). The strategy aims to provide policy-makers with guidance in relation to the core requirements. It is expressly not a listing of all the possible research topics related to aquaculture. It should also not be seen as the basis of specific calls for research by funders.

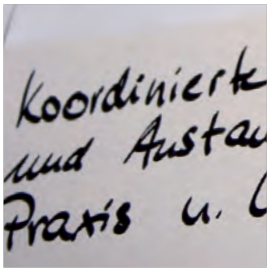
For a successful strategy it is essential that

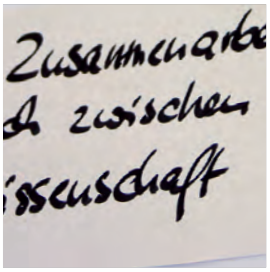
(a) there is a central clearly formulated goal supported by consensus, and

(b) there is a set of actions which commits the scarce resources to this core objective. The following addresses these requirements.

The aims and recommendations of the DAFA strategy were discussed and further developed in expert workshops in Hannover and Berlin.

2 Aim of the strategy





Current status: Global aquaculture is growing rapidly but the sector is stagnated in Germany and Europe.

Worldwide, aquaculture is the fastest growing segment of the food industry. The production (excluding aquatic plants) is already estimated to be 66 million tonnes per year. Aquaculture will soon exceed capture fisheries in terms of output, which have stagnated at about 90 million tonnes per annum.

Approximately 90 % of global aquaculture production is in Asia. In many Asian countries, production has recently increased at a rate equivalent to doubling each decade. There is also strong growth in South America, Canada, Oceania, Egypt and Turkey.

In Europe, aquaculture is expanding only in Norway. Annual production in Europe (including Norway) is under 3 million tonnes.

Annual aquaculture production in Germany is, according to official statistics, approximately 40,000 tonnes. We expect it is actually slightly higher. By comparison, the German fishing fleet lands about 70,000 tonnes per annum. The fleet also lands 170,000 tonnes per annum outside Germany. Fish consumption in Germany is almost 1.3 million tonnes per annum.

The self-sufficiency rate for seafood in Germany is less than 20 % and the contribution of Germany to global aquaculture production is less than 0.1 %.

The existing water resources offer expansion potential for environmentally-friendly aquaculture.

This applies to freshwater and marine sites.

70, 80, 90 % of fish is imported – a good development?

In a world of specialisation and division of production activities, it may well make sense that a country relies on imports of some important goods and services.

Most of the finfish, shellfish or algae from aquaculture that are consumed in Germany comes from other countries. Are these countries intrinsically better at aquaculture than we are? Is aquaculture such a labour-intensive process that our high wages prevent the sector growing here? Or does aquaculture have a lower environmental impact in these countries? And if that were true, must this international allocation and use of resources be accepted as a consequence of market forces?

One can look at this in another way: Isn`t Germany with its relatively abundant water resources suited to aquaculture, especially in times of climate change? Are products from local aquaculture not better than import goods from the perspective of sustainability, animal welfare and/or food safety? Does the frequently cited consumer desire for regional food not apply to fish?

Behind all these questions lie hypotheses that currently can only partly be answered scientifically. The foundations for business and policy decisions are therefore weak.

National expansion – useful guide for research?

The German multiannual national strategic plan, which is being developed by German Federal and State governments under the EU's reform of fisheries policy, provides a clear direction for the development of national aquaculture: environmentally sound growth.

The German strategic plan sets out national growth targets allocated to the sub-sectors of aquaculture. This approach using targets that fulfil EU requirements brings with it opportunities and risks:

It provides an opportunity to align the actions of policy, business and science actors. This leads to more coordinated and powerful community actions. This advantage must be considered alongside the risk that development led by public policy focused on output targets fails in markets with the result that private sector businesses and research organisations make poor investments.

Since the DAFA strategy should be aligned with long-term goals and because specific volume targets are increasingly irrelevant with lengthening time horizon, DAFA is committed to broad objectives.

Two long-term aims of the DAFA strategy

1. Aquaculture products consumed in Germany should promote human health, meet the highest food safety standards and come from sustainable production based on high animal welfare standards.

2. The German aquaculture sector should realise its full competitive potential.

Objective (1) is open to trade and encourages that high standards be applied to fish products of all origins. It means that foods, whatever their origin

- are free from hazardous residues and other dangers, and
- have good nutritional properties that the consumer can recognise.

The objective aims to see that the production of these foods

- causes the minimum of impact the environment,
- meets high standards of animal welfare, and
- complies with internationally accepted employment and social standards.

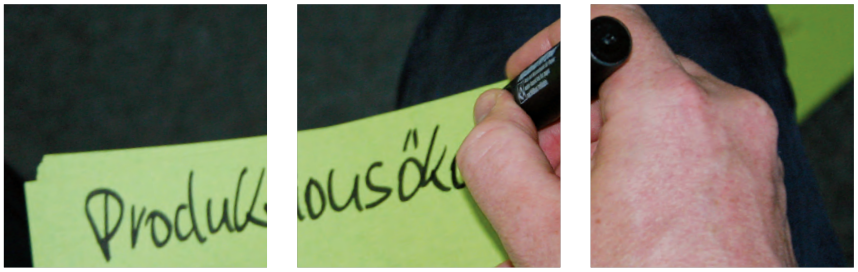
Objective (2) relates to raising the potential of the German aquaculture sector. Basically, production should have a local orientation and be of a high standard to support relevant claims relating to process quality. It would make no sense to provide long-term subsidies to German aquaculture to compensate for higher costs compared with production in other places where conditions are more favourable.

However, the DAFA Expert Forum has come to the conclusion that Germany has competitive potential that has not yet been realised. Therefore, objective (2) aims to

- determine which aquaculture products, production systems and locations characterise this un-tapped potential,
- identify the most promising ways of exploiting this potential and
- assess options and derive recommendations for policy and business.

A secondary goal here is to identify where Germany might have an advantage in exporting technology, even for production systems that are themselves not expected to be successful in the long term in Germany.

3 Derivation of promising measures



The traditional approach to research investment won't be sufficient

The „usual" approach to the drafting of research strategies is to list a large number of interesting current research topics that should find their way into research programs.

In this way, research addresses component technologies and techniques (e.g. breeding, feeding, husbandry technology) with policy-makers expecting that the results will generally improve the competitiveness and/or the environmental performance of the sector.

Such an approach which is oriented primarily on technology development and less on fundamental strategic guidelines and ideas was considered by the Forum. After detailed discussion, it was decided to focus the strategy on the context for development, since the aims of DAFA Expert Forum will not be achieved with technology alone.

Two background aspects influenced the thinking of the Forum experts:

Fragmentation of the sector

Most of the approximately 30 research institutions conducting aquaculture research in Germany have only limited research capacity. Sustainable research consortia comprising such institutions are rare. It is not expected that conventional project funding will result in international competitiveness or ground-breaking changes for German aquaculture. The more likely outcome of such funding is the development of some themes with limited local impact.

Open questions about the orientation of the sector

It is still quite unclear what the priorities should be in levering resources to achieve the goals of the DAFA strategy. More and better controlled production in Germany with lower transport costs? Which fish species and production systems? Where to concentrate research efforts (environmental law, technology, fish farming, organic market, investment aid, etc.)? How to develop the German sector in a market dominated by imports (certification systems, food control, development cooperation, etc.)?

To address these, DAFA made three core recommendations that are described in detail below:

Core Recommendations

I. Studies of potential and prospects

II. A collaborative project entitled “site-optimised expansion of aquaculture”

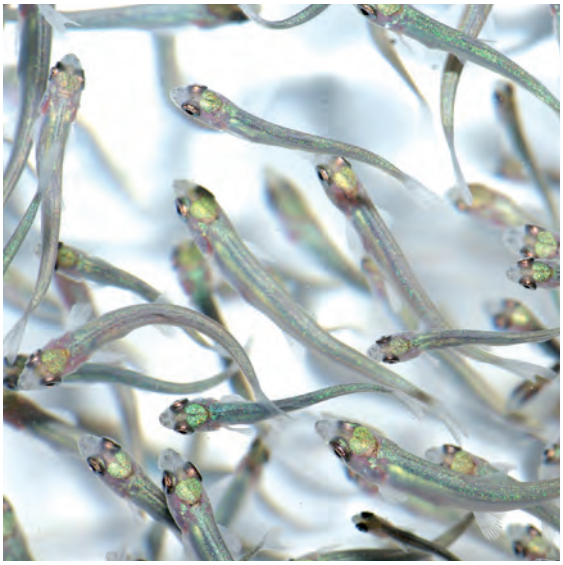
III. Development of a (virtual) German Aquaculture Centre

The discussions on the strategy have shown that research funders do not address this infrastructural aspect (see recommendation III). Rather than foster research collaborations they tend to concentrate on funding “real” research.

Therefore, DAFA holds the view that research policy must go beyond merely administering the flow of funds through the normal channels. If the strategic outcomes cannot be achieved by the usual mechanisms of funding research, then research policy is obliged to modify the mechanisms it uses.

This research requires the engagement of the best scientists and researchers who are active in aquaculture. However, this is only possible if research policy provides the necessary resourcing.

Alongside research policy, agricultural and fisheries policy also has a role to play. Part of the aim of this strategy is indeed to create the conditions for a fundamental, long-term improvement of the performance of the German aquaculture sector. To this end, an integrated approach is required to exploit synergies between two relevant sectors of the economy (agriculture and aquaculture).



Recommendation I
Studies of potential and prospects

Why has the German aquaculture sector not kept up with international developments? Which fish species and farming systems gives the sector the best chance to compete? Where can interventions start? What potential does recycling, coupled and cascade uses (of water) offer? Is it justified to generally attribute lower environmental and social standards and/or food-related risks to imports? What production potential could be realized in Germany‘s maritime areas? Under what conditions would such use forms gain social acceptance?

Such questions cannot be sufficiently addressed because the relevant scientific analyses are missing. The information available is not sufficient to provide a holistic assessment of the performance of different aquaculture systems.

For strategic economic and policy planning, it is important to at least be able to estimate approximately the national and international competitive position of production systems. This applies to the valuation of output in terms of process quality (environmental and animal welfare aspects), product quality and production costs. The German national strategic plan was developed without this knowledge base, so statements are based on assumptions and many temporary concepts. Only through the implementation of this first recommendation would the chance be created to continue writing the strategic plan in a few years on a good knowledge base and to develop it further.

Therefore, DAFA recommends the scarce research resources be initially prioritised to clarify the prospects for German aquaculture in international competition. This needs to identify the most promising starting points for the eventual expansion of German aquaculture or for other strategic priorities (e. g. technology export).

This task primarily requires close interdisciplinary cooperation between technologists, economists, social scientists and legal specialists working with industry. So far, only a few research groups operate in such an environment.

Analyses should be focused on:

- Comparisons between German production systems and those that dominate imported produce (including method development). The comparative assessment includes, first, the description of the typical regional production systems (including recording physical input and output quantities); economic analysis (production, processing and transportation costs, prices); and other considerations relevant to a sustainability assessment (environmental effects, social aspects, etc.).

- Development of production chain concepts to secure the consumer safety and health qualities of aquaculture. A focus of this is the challenges that arise from the international transport of goods.

- Feasibility of improving the competitiveness of production in Germany. This includes assessing the potential for reducing costs and consideration of ways of accessing high value markets (both these approaches are to be applied to existing production facilities).

- Assessment of the potential for expansion of freshwater aquaculture in Germany through sustainable use of additional water resources and through combination with agricultural-horticultural land use.

- Quantitative and economic assessment of the potential of mariculture in the North and Baltic Sea. The first requirement is an assessment of which production quantities could be produced and what environmental effects this would have. Secondly, the estimated production costs for different technology concepts are to be determined.

- Possibilities and limitations of market segmentation for farmed fish. The differentiation of production leads to different product qualities (e.g. as a result of different feeding strategies) and different process quality (e.g. due to different husbandry systems). Positioning German aquaculture products in the higher-priced segment of the market can only be successful if appropriate consumer preferences are available. This requires insight into consumer preferences and aspirations with respect to different production systems.

- Analysis of strategies by which an expansion of aquaculture has been pursued in various countries around the world, identifying factors for success and failure, drawing conclusions for Germany.

- Assessment of strategies that are not primarily geared to the additional production of fish in Germany but to other forms of added value (e.g. set fish production, technology exports, improved genetics).

It is necessary to ensure that the results of the analyses outlined here are comparable and allow a coherent overall assessment of different development paths.

This requires in particular that the data obtained in the investigations of the different production systems outlined above (input, output, emissions, cost components, etc.) are made available to all the projects in a standardised data and measurement format.

The common data and format indicators have to be developed in the first project (international comparative evaluation of production systems). This project will be designed from the outset as a longer-term infrastructure project, i. e. the institutions supporting the study should continue the work beyond the duration of funding priority, in the context of an international group of experts

The international networking of the expertise and the associated data resources within the German aquaculture centre (recommendation III) provides strategic potential. For example, whenever there are new questions concerning the development of production systems, the existing infrastructure can be used to rank the planned new development in comparison to the standard international production systems.

Recommendation II
A collaborative project entitled "site-optimised expansion of aquaculture"

There is consensus amongst experts that the expansion of aquaculture in Germany has been hindered by development planning constraints.

We need to differentiate two aspects: (a) the assessment of how useful and appropriate the existing rules are and how effective the implementation of these rules by the authorities is and (b) how Germany could regulate to better support expansion of socially acceptable aquaculture systems.

In this debate, there are different lines of argument that are now woven into a Gordian knot that will not be easy to disentangle. Specifically regarding:

- Ethical issues (e.g. how should we produce fish? What negative environmental impacts are acceptable? Is it legitimate to export alleged or actual problems of aquaculture to other countries?)
- Economic issues (e.g. how does regulation affect economic competitiveness? Is there a premium market for fish from high process standards?)
- Environmental issues (e.g. what are the consequences of more intensive use of water resources?)
- Issues relating to product quality (e.g. what needs to be done to maximise the safety and health benefits of products?)
- Production-related issues (e.g. can recirculation systems be optimized so that they are accepted by consumers and at the same time profitable?)
- Political and legal issues (e.g. do the current planning procedures support the outcomes sought by an enlightened public?)

Science can make numerous contributions to answering the relevant individual questions, and, with the help of a comprehensive research programme, science can advance evidence-based policy development and decision making. As long as the individual research approaches and the resulting assessments are not integrated, optimal evidence-based regulation will be difficult to support.

Therefore, DAFA proposes that a comprehensive interdisciplinary analysis of the issues using case studies be conducted. This would require the research funders to support collaborative research that requires consortia to develop and assess different pathways of expansion for specific sites.

These analyses need to include:

- Selection of appropriate study sites with the following characteristics: suitable in principle for expansion of aquaculture, local economic interest in expansion, willingness of local authorities to participate
- Analysis and evaluation of the current procedures in the context of expansion of aquaculture. Impact assessments with the view to realising opportunities and assessing profitability, economic and environmental consequences of implementation of the investment plans (baseline scenario)
- Analysis and evaluation of alternative investment scenarios (changing regulations and procedures concerning the planning, effects of changes in production systems from near-natural to high-tech) and economic-environmental impact assessments compared to baselines
- Evaluation of the impact of the baseline scenarios and the alternative scenarios from the perspective of different groups (intensive analysis, including use of focus groups, identifying their expectations of aquaculture informed by the economic and environmental consequences of different scenarios)
- Analysis of the responsibilities, the basis of decisions, regulatory room to manoeuvre and procedures in the approval process; development of alternative methods options along with the stakeholders; assessment of the impact of different options
- Derivation of recommendations that can be transferred into planning practice in other regions and circumstances, and derivation of policy recommendations

Substantial investment in inter-disciplinary consortia is required to deliver on these needs.Interaction of technological, biological, ecological, legal and socio-economically oriented scientists is important. This needs to be combined with interaction with decision makers (economic, regulatory) in the study regions.

Recommendation III
Development of a (virtual) German Aquaculture Centre

The fragmentation of the German aquaculture research is alarming. While there is considerable expertise in different locations, this is focused on individual subject areas and often with a strong regional focus. Although the latter serves applied problems well, the capacity to address wider strategic systems questions is limited. This limits the ability to conduct systems research that can impact on commercial actors and public policy.

The small number of scientists working on aquaculture in individual institutions means that the capability is not resilient, with teaching and research compromised if key scientists and technologists are unavailable. The narrow personnel base in the sector as a whole means that there is a lack in some areas of both qualified young research scientists and qualified young practitioners in the private sector.

The under-developed organisation of aquaculture research also means that no single organisation feels responsible for the functioning of the German aquaculture research sector. Thus it may happen that an academic position at a university is not filled (e.g. for fish diseases) because the university regards aquaculture as a rather marginal activity.

Overall, therefore, it should be noted that the German research landscape does not currently offer favourable conditions to support the aquaculture industry with research that is competitive with research facilities in other countries. In some other European countries, much better conditions prevail because public policy has led to powerful national centres.

A research and training centre that can compete with national centres in other countries, would be a big boost for the German aquaculture sector. Based on previous experience, however, it cannot be expected that a single German Federal State or a single institution can bring together the resources to develop a centre of sufficient capacity.

DAFA therefore regards it as particularly urgent that the Federal and relevant State governments at least create the conditions that can lead to a secure and better bundling of existing research resources.

It would be very important not to limit this endeavour to agreements to cooperate within existing frameworks to stabilize the status quo under difficult financial circumstances. It needs to initiate something new providing the spark for developments that lead to significant im-

provement in the competitiveness of the German aquaculture sector. A process needs to be initiated that will lead to a national centre, which can be a virtual centre, either in the initial phase or permanently. This means it would be based on the existing facilities. The important feature is that a strategy for the centre is developed which has the commitment of partners and which is implemented.

DAFA is aware that this will be a difficult political undertaking because research structures and government responsibility for research is fragmented in Germany. Since universities, colleges, and government research establishments funded at the Federal and the State level and other research institutions operate in German aquaculture research, Federal and State governments need to be committed to this step.

DAFA suggests, therefore, that this matter be addressed by the Conference of German State Agriculture Ministers, supported if necessary by the Conference of German State Science Ministers, with the aim of mandating the development of relevant structures. The German Federal Government should play a leading role. Dialogue between Federal and State governments can establish the conditions for funding and operation and provide guidance on a competitive process leading to its establishment.

A competitive process is worthy of consideration to (a) select the most promising consortia, (b) fully exploit the organizational innovation potential of existing contributing facilities and (c) inform interested stakeholders (e. g. Ministries, Universities) of financial commitment required. An alternative approach, which is not recommended expressly by the DAFA, would be to negotiate a cooperation agreement between all relevant research institutions in Germany. Experience indicates that this alternative leads to more casual statements of intent. This would not significantly change the current situation, and therefore is not sufficiently robust to overcome the problems within German aquaculture research.

DAFA therefore expresses preference for a smaller network that has greater strategic backing. Characteristics of such a network would be (a) compelling goals, (b) a common strategy process, (c) commitment of fixed resources of all partners, (d) clearly defined responsibilities, (e) adequate access to the practice, and (f) documented expertise of partners.

Our current understanding of the research system leads DAFA to conclude that it is advisable to seek the following basic conditions:

- Contractual merger of efforts with at least one university and several Federal and State non-university institutions involved to ensure joint research and teaching (should, if possible, incorporate existing networks, such as ARGE Binnenfischerei)
- Designation of a headquarters for the centre, with a correspondingly significant financial participation on the part of corresponding Federal State
- Coverage of important research and teaching areas including as a minimum (1) breeding, (2) nutrition, (3) animal health and veterinary medicine, (4) animal welfare and protection, (5) husbandry systems and technology, (6) product quality, food and feed safety (7) production economics and market analysis, (8) aquatic ecology and environmental impact assessment (alone or in combination)
- Establishment of cross-site bachelor, master and doctoral courses of study (with access to a leading international university at master and doctoral level), with undergraduate teaching focused at long-term facilities
- Synergistic interaction with vocational education and training in aquaculture
- Participation in international organisations and research programmes for the development of aquaculture
- Establishment of a national information system for aquaculture, possibly a national journal

The discussions have led to three possible approaches to financing:

1. Use of the future European Maritime- and Fisheries Fund (EMFF)
2. The commitment of several German Federal Ministries (e.g. BMEL, BMBF, BMWi, BMUB) under the auspices of the Federal Bioeconomy Strategy
3. A common strategy of several German Federal States

Recirculating aquaculture system

Cluster of mussels

Ecological pond aquaculture

Conventional trout farm

4 Outlook

It must again be emphasized that the three core recommendations of this strategy aim to achieve a substantial and sustainable improvement in German aquaculture research. Research sponsored by the EU, German Federal and State governments that now pursues different objectives and thus supports different research approaches make important contributions to German aquaculture. These are welcome, but they cannot replace the measures proposed herein.

Some of the measures proposed require a commitment to funding that goes far beyond the usual three-year cycle used in funding research. The leading players will only commit to this initiate if there is reliable long-term funding and if this is handled in fundamentally new ways.

In this respect, it is of particular importance that the agriculture, fisheries and research policy communities join forces, use new ways of working, and fulfil their responsibilities together.

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University of Vechta, Institute for Spatial Analysis and Planning in Areas of Intensive Agriculture

Universities of Applied Science

Anhalt University of Applied Sciences, Department of Agriculture, Ecotrophology and Landscape Development

University of Applied Sciences in Eberswalde, Faculty of Landscape Management and Nature Conversation

Nürtingen-Geislingen University, Institute of Applied Agricultural Research

Geisenheim University

University of Applied Sciences Osnabrueck, Faculty of Agricultural Sciences and Landscape Architecture

South Westphalia University of Applied Sciences, Department of Agricultural economics

University of Applied Sciences Weihenstephan-Triesdorf

Other Research Institutes

Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research

German Institute for Tropical and Subtropical Agriculture

German Institute of Human Nutrition Potsdam-Rehbrücke

ZB-MED – Leibniz Information Centre for Life Science

FiBL Germany, Research Institute of Organic Agriculture

Frankenförder Forschungsgesellschaft mbH

Fraunhofer Institute for Interfacial Engineering and Biotechnology

Fraunhofer Institute for Process Engineering and Packaging

Institute for Rural Development Research

IMARE Institute of Marine Resources GmbH

The Association for Technology and Structures in Agriculture

Leibniz Institute of Agricultural Development in Transition Economies

Leibniz Institute for Agricultural Engineering Potsdam-Bornim

Leibniz-Institute of Vegetable and Ornamental Crops

Leibniz-Institute of Freshwater Ecology and Inland Fisheries

Leibniz Institute for Farm Animal Biology

Leibniz Institute of Plant Genetics and Crop Plant Research

Leibniz Centre for Agricultural Landscape Research

Federal Research Institutes

Federal Institute for Risk Assessment

Germany's National Meteorological Service, Centre for Agricultural Meteorology Research

Friedrich-Loeffler-Institute, Federal Research Institute for Animal Health

Johann Heinrich von Thünen Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries

Julius Kühn-Institut, Federal Research Centre for Cultivated Plants

Max Rubner Institute, Federal Research Institute of Nutrition and Food

Research Institutes of the States

Bavarian State Research Center for Agriculture

Education and Knowledge Centre Boxberg, National Institute for pig breeding

Institute of Inland Fisheries Potsdam-Sacrow

State Education and Research Center of Viticulture and Horticulture and Rural Development

State Office for Rural Development, Agriculture and Land Reallocation (Brandenburg)

State Institute for Agriculture, Forestry and Horticulture Saxony-Anhalt

Hessen State Agricultural Office

State Research Institute for Agriculture and Fisheries Mecklenburg-Western Pomerania

Agricultural Technology Centre Augustenberg

Agricultural Center for cattle production, grassland management, dairy management, wildlife and fisheries Baden-Wuerttemberg

Chamber of Agriculture Lower Saxony

Chamber of Agriculture North Rhine-Westphalia

RLP AgroScience GmbH

Saxon State Agency for Environment, Agriculture and Geology

Horticultural College and Research Institute Baden-Wuerttemberg, Heidelberg

Thuringian State Institute of Agriculture

DAFA thanks all persons who made posts and comments to the drafts and enabled lively discussion in the development of this strategy.

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ISBN 978-3-86576-144-6