Leibniz Gemeinschaft

Der Senat

26. November 2019

Stellungnahme zum Leibniz-Institut für Nutztierbiologie, Dummerstorf (FBN)

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Vorbemerkung

Die Einrichtungen der Forschung und der wissenschaftlichen Infrastruktur, die sich in der Leibniz-Gemeinschaft zusammengeschlossen haben, werden von Bund und Ländern wegen ihrer überregionalen Bedeutung und eines gesamtstaatlichen wissenschaftspolitischen Interesses gemeinsam gefördert. Turnusmäßig, spätestens alle sieben Jahre, überprüfen Bund und Länder, ob die Voraussetzungen für die gemeinsame Förderung einer Leibniz-Einrichtung noch erfüllt sind.[1]

Die wesentliche Grundlage für die Überprüfung in der Gemeinsamen Wissenschaftskonferenz ist regelmäßig eine unabhängige Evaluierung durch den Senat der Leibniz-Gemeinschaft. Die Stellungnahmen des Senats bereitet der Senatsausschuss Evaluierung vor. Für die Bewertung einer Einrichtung setzt der Ausschuss Bewertungsgruppen mit unabhängigen, fachlich einschlägigen Sachverständigen ein.

Vor diesem Hintergrund besuchte eine Bewertungsgruppe am 11. und 12. April 2019 das FBN in Dummerstorf. Ihr stand eine vom FBN erstellte Evaluierungsunterlage zur Verfügung. Die wesentlichen Aussagen dieser Unterlage sind in der Darstellung (Anlage A dieser Stellungnahme) zusammengefasst. Die Bewertungsgruppe erstellte im Anschluss an den Besuch den Bewertungsbericht (Anlage B). Das FBN nahm dazu Stellung (Anlage C). Der Senat der Leibniz-Gemeinschaft verabschiedete am 26. November 2019 auf dieser Grundlage die vorliegende Stellungnahme. Der Senat dankt den Mitgliedern der Bewertungsgruppe und des Senatsausschusses Evaluierung für ihre Arbeit.

1. Beurteilung und Empfehlungen

Das Leibniz-Institut für Nutztierbiologie (FBN) in Dummerstorf hat die Aufgabe, Grundlagen- und angewandte Forschung auf dem Gebiet der Biologie landwirtschaftlicher Nutztiere zu betreiben. Im Mittelpunkt stehen die Wechselwirkungen zwischen der Genetik der Tiere, deren Physiologie und Verhalten sowie ihrer Umwelt. In den sechs Teilinstituten des FBN arbeiten Wissenschaftlerinnen und Wissenschaftler aus der Biologie, der Agar- und Ernährungswissenschaften, der Veterinärmedizin, den Ingenieurwissenschaften sowie der Informatik und Mathematik. Die Forschungsergebnisse dienen als Grundlage für technologische Entwicklungen und Beratungsleistungen in Bezug auf eine tiergerechte sowie ressourcen-, klima- und umweltschonende Nutztierhaltung.

Die **letzte Evaluierung** des FBN fand 2015 statt. Der Senat hielt seinerzeit fest, dass das FBN mit seinen technischen Entwicklungen und Beratungsleistungen für den landwirtschaftlichen Anwendungsbereich von großer Bedeutung sei. Um auf längere Sicht den Ansprüchen an eine Forschungseinrichtung von überregionaler Bedeutung und gesamtstaatlichem wissenschaftspolitischem Interesse zu genügen, müsse das FBN seine Leistungen jedoch deutlich steigern. Dieser Prozess müsse von Beirat und Aufsichtsgremium erheblich stärker als bisher mit vorangetrieben werden, damit das Institut seine Rolle als Leib-

[1] Ausführungsvereinbarung zum GWK-Abkommen über die gemeinsame Förderung der Mitgliedseinrichtungen der Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz e. V.

niz-Einrichtung voll entfalten könne. Der Senat sah in der auch im internationalen Vergleich herausragenden Ausstattung des FBN mit Gebäuden, Anlagen und Tierbeständen gute Voraussetzungen für die künftige Entwicklung. Es sei die vordringliche Aufgabe einer neuen Institutsleitung (der frühere Direktor ging im Frühjahr 2015 in den Ruhestand), innovative Fragestellungen zu entwickeln und die wissenschaftlichen Leistungen des Instituts zu verbessern. Der Senat empfahl, die nächste Evaluierung des FBN bereits 2019 vorzusehen. Bund und Länder folgten dieser Empfehlung.

Im Oktober 2016 wurde der langjährige Leiter eines der sechs FBN-Institute in gemeinsamer Berufung mit der Universität Rostock zum neuen Direktor bestellt. Er hatte das FBN zuvor bereits kommissarisch geführt. In den folgenden Jahren konzentrierten sich das FBN und seine Gremien darauf, **Empfehlungen der letzten Evaluierung zu einzelnen Aspekten** umzusetzen. So wurden die Publikationsstrategie sowie die Konzepte für die Einwerbung von Drittmitteln und die leistungsorientierte Mittelvergabe überarbeitet. Zudem wurden die gemeinsam von den Instituten bearbeiteten Programmbereiche neu strukturiert. Durch eine Satzungsänderung wurde die vom Senat 2008 und erneut 2015 angemahnte externe wissenschaftliche Nutzung der Forschungsinfrastrukturen des FBN ermöglicht.

Jedoch stagnierten die Leistungen. Die **Arbeitsergebnisse und -planungen der sechs FBN-Institute** werden in zwei Fällen als „sehr gut", in zwei Fällen als „gut bis sehr gut" und in zwei Fällen als „gut" bewertet. Damit ergibt sich das identische Spektrum wie vor vier Jahren. Nach wie vor werden die Beratungsleistungen des FBN und seine technologischen Optimierungen von Ministerien, Behörden und Unternehmen nachgefragt. Die Öffnung der Forschungsinfrastrukturen führte erwartungsgemäß zur Beteiligung des FBN an einem großen EU-geförderten Infrastruktur-Projekt. Arbeiten zu grundlegenden aktuellen Forschungsfragen werden jedoch nach wie vor nur in begrenztem Maße angegangen. Es ist nicht gelungen, eine wissenschaftliche Dynamik am Institut zu erzeugen, die in diesem wesentlichen Punkt den erforderlichen Innovationsschub erwarten lässt.

Die verschiedenen nach der letzten Evaluierung ergriffenen Einzelmaßnahmen wurden nicht in eine überzeugende **wissenschaftliche Gesamtstrategie** integriert. Das FBN hat lediglich allgemeine Ziele definiert (s. Anlagen A: Darstellung und C: Institutsstellungnahme), aus denen allerdings keine grundlegenden, wissenschaftlich innovativen Fragestellungen abgeleitet wurden, an denen sich die Arbeit in den Teilinstituten orientieren kann. Stattdessen wird die Forschungspraxis am FBN nach wie vor zu stark durch die technischen Möglichkeiten der umfangreichen Infrastrukturen gesteuert. Die vom Senat vor vier Jahren erwarteten Veränderungen wurden nicht in ausreichendem Maße erreicht.

Das Vorgehen bei der **Besetzung von Leitungspositionen** am FBN entspricht nicht den Erwartungen an ein Leibniz-Institut. Seit 2009 besteht für fünf, inzwischen für alle sechs Institutsleitungen die Möglichkeit, diese in gemeinsamer Berufung mit der Universität Rostock zu besetzen. Es ist unverständlich, dass dennoch in den vergangenen zehn Jahren alle drei Vakanzen nicht als gemeinsame Berufungen besetzt wurden, sondern über die Beförderung von Personen, die bereits zuvor am FBN tätig waren. Zwei Institutsleitungen sind zwar gemeinsam mit der Universität auf W2-Professuren berufen, allerdings wurde der Ruf jeweils unabhängig von der Übertragung von Leitungsaufgaben am FBN erteilt.

Die Zahl der **Promotionsabschlüsse** ging seit der letzten Evaluierung deutlich zurück. Zwischen 2011 und 2013 wurden 41 Promotionen abgeschlossen, in den Jahren 2015 bis 2017 waren es nur noch 27 Abschlüsse. Promovierende können an verschiedenen Kursen des FBN und an der Graduiertenakademie der Universität Rostock teilnehmen. Jedoch wurde nicht die Empfehlung umgesetzt, ein strukturiertes Doktorandenprogramm einzurichten, das die fachübergreifenden Spezifika des FBN für die Ausbildung nutzt.

Die **institutionelle Förderung** des FBN wuchs von im Schnitt 16,4 Mio. € p.a. (2011-2013) auf 20,3 Mio. € p.a. (2015-2017) und war damit für die Institutsaufgaben einschließlich der Finanzierung der umfänglichen Infrastrukturen auch in den vergangenen vier Jahren auskömmlich. In jüngster Zeit hat das FBN höhere Summen für Projektförderungen eingeworben; in den Berichtsjahren 2015-2017 lagen die **Drittmittelerträge** jedoch auf einem ähnlich niedrigen Niveau wie bei der letzten Evaluierung (ca. 10 % des Gesamtbudgets).

Der Senat erkennt an, dass das FBN methodische und technologische Entwicklungen erarbeitet und Beratungsleistungen erbringt, die von Ministerien, Behörden und der Agrarindustrie nachgefragt werden. Er sieht auch, dass in einzelnen FBN-Instituten sehr gute wissenschaftliche Leistungen erbracht werden. Es ist dem FBN jedoch nicht gelungen, ein übergreifendes, an Leitfragen orientiertes Forschungsprofil zu entwickeln. Es fehlt ein Konzept, um die notwendige Dynamik für fachübergreifende, wissenschaftlich innovative Ergebnisse zu erzeugen. Auch in der Förderung des wissenschaftlichen Nachwuchses sind die Leistungen nicht überzeugend. Insgesamt erfüllt das FBN nicht mehr die Anforderungen, die an eine Einrichtung von überregionaler Bedeutung und gesamtstaatlichem wissenschaftspolitischem Interesse zu stellen sind, die als Leibniz-Institut gefördert wird.

2. Zur Stellungnahme des FBN

Das FBN hat zum Bewertungsbericht Stellung genommen (Anlage C) und begrüßt verschiedene Aspekte der Bewertung. Das Institut hält daran fest, dass die zwischen der vergangenen und der jetzigen Evaluierung eingeleiteten Reformschritte eine hinreichende Grundlage für weitere Verbesserungen darstellen, die im Bewertungsbericht als notwendig erachtet werden.

Der Senat teilt diese Auffassung nicht. Die nun angekündigte weitere Ausformulierung von Reformen zum Beispiel in der Nachwuchsförderung ist keine hinreichende Reaktion auf die grundlegende konzeptionelle Kritik. Auch in der Institutsstellungnahme wird kein über den bereits bekannten Stand hinausgehendes Gesamtkonzept mit wissenschaftlich innovativen Fragestellungen skizziert. Das FBN hält die internen Prozesse zur Generierung von neuartigen Forschungen für ausreichend und eröffnet insofern auch prozessual keine neuen Perspektiven.

3. Förderempfehlung

Der Senat der Leibniz-Gemeinschaft empfiehlt Bund und Ländern, die gemeinsame Förderung des FBN als Einrichtung der Forschung und der wissenschaftlichen Infrastruktur auf der Grundlage der Ausführungsvereinbarung WGL zu beenden.

25 March 2019

Annex A: Status report

Leibniz Institute for Farm Animal Biology, Dummerstorf (FBN)

Contents

1. Structure, Tasks and Institutional Environment

Development and funding

The Leibniz Institute for Farm Animal Biology (FBN) in Dummerstorf has its origin in the "Kaiser-Wilhelm-Institut für Tierzuchtforschung", which was founded in 1939. Until 1990 it was the central institute of the GDR regarding research on farm animals and their nutrition. In 1993 the institute was re-founded a Foundation of the Public Law and Institute of the Blue List (later Leibniz-Association). Since then FBN is jointly funded by the Federal Government of Germany and the *Länder* Governments. The last evaluation by the Senate of the Leibniz Association took place in 2015.

Responsible department at *Länder* level: Ministry of Agriculture and the Environment Mecklenburg-Vorpommern

Responsible department at federal level: Federal Ministry of Food and Agriculture (BMEL)

Legal form and organisation

The FBN is a foundation under public law supported by the Federal Ministry of Food and Agriculture (BMEL) and Ministry of Agriculture and the Environment Mecklenburg-Vorpommern. There are the following governing bodies of FBN:

The Board of Curators decides on all fundamental matters. It appoints the Director, decides on the Programme Budget and verifies its compliance and its implementation. The Board of Curators comprises two delegates of the BMEL, and one each from the Ministry of Agriculture and the Environment and the Ministry of Education, Science and Culture of Mecklenburg-Vorpommern. The current Board of Curators consists of seven members with voting rights and one advisor with guest status. The Chairperson of the Scientific Advisory Board (SAB) as well as two scientists proposed by the SAB are members of the Board of Curators.

The Director chairs the FBN and, in consultation with the Heads of the Institutes, draws up the scientific programme. The Director reports to the Board of Curators.

The Scientific Advisory Board (SAB) advises the Board of Curators and the Director on all important scientific issues, and comments on all budgetary projects with special reference to scientific soundness and the FBN's strategic development. The SAB consists of eight external scientists, who are scientifically active in the research areas covered by the FBN. Members are appointed by the Board of Curators for a term of four years with the possibility of renewal for one further term.

Mission and tasks

FBN's mission is to investigate the intrinsic biological processes of animals in their specific environmental contexts to understand and use their functional biodiversity to develop solutions for sustainable livestock farming. The goal is to improve animal health and welfare, adaptability and biodiversity as well as resource efficiency by applying the latest technologies in animal sciences.

Research structure

Research is organized in a matrix structure (see appendix 1a).

The first dimension is given by the six permanent institutes that represent the science disciplines. The institutes are FBN's working units, with the scientific and administrative responsibilities and functions necessary to fulfil their specific tasks. The six institutes comprise 17 Research Units, four Junior Research Groups, one Work Group and six Service Groups. In addition, since 2018 there is one Core Facility and one Independent Research Group, which both report directly to the Director (see appendix 1b and chapter 3 for a detailed description of the groups).

The second dimension of the matrix is given by the three temporary programme areas as defined by the annual programme budget. The budget is evaluated internally on an ongoing basis by the Science Committee of the FBN (see chapter 6), and externally on an annual basis by the SAB, and then approved annually by the Board of Curators.

National and international scientific environment

According to FBN, the institute occupies in its national scientific environment a unique position with its comprehensive systemic interdisciplinary approach and breadth of expertise in animal science, unique infrastructure, and dedication to the intrinsic biological processes and biodiversity of farmed animals for sustainable livestock farming. A major component of the FBN's research environment are university faculties of agricultural sciences (Bonn, Giessen, Göttingen, Halle, Hohenheim, HU Berlin, Kassel, Kiel, Rostock, TU Munich) as well as veterinary science (FU Berlin, TiHo Hannover, LMU Munich, Leipzig, Giessen).

In the national non-university research landscape, agricultural research takes place in the Leibniz Association. Especially, the Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB) and the Leibniz Centre for Agricultural Landscape Research (ZALF) are related to the FBN's scientific environment. Other players are the Departmental Federal Research Institutes associated with the BMEL. Thematic intersections with the Friedrich-Loeffler-Institut (FLI), Thünen Institut (TI) and Max Rubner-Institut (MRI) are found in cooperative and complementary research in animal nutrition and nutrigenomics, animal welfare, fish immunology and muscle biology. Research coordination between Departmental Federal Research Institutes and the six Leibniz Institutes assigned to the BMEL take place in the BMEL's "Research Steering Committee".

At the European level, faculties of agricultural science and veterinary medicine at many universities also shape the FBN's scientific environment. Examples of important non-university institutions in Europe are the National Institute for Agricultural Research (INRA) in France, the Institute for Agrifood Research and technology (IRTA) in Spain, the Natural Resources Institute Finland (LUKE) in Finland or Teagasc - The Agriculture and Food Development Authority in Ireland.

Non-European universities with departments and faculties of animal sciences address research fields comparable to those of the FBN (e.g.: Cornell University, Iowa State University or Michigan State University). Non-university research institutions, although mostly

by magnitudes larger than the FBN, include the Agricultural Research Service (ARS, Department of Agriculture, U.S.A.), the Agriculture and Agri-Food Canada (AAFC, Canada), the Chinese Academy of Agricultural Sciences (CAAS, China), the Indian Council of Agricultural Research (ICAR, India), the International Livestock Research Institute (ILRI, Kenya), the Commonwealth Scientific and Industrial Research Organisation (CSIRO, Australia) and the AgResearch (New Zealand).

National interest and justification for funding as a non-university institution

According to FBN, gaining a comprehensive understanding of the physiological and ethological needs and capacities of farmed animals is of global importance. Animal husbandry contributes significantly to the bio-economy and in particular to food security. In light of the global challenges to food security, health and biodiversity as a result of population growth and climate change, there is an urgent need to improve livestock management. Research on livestock agriculture is especially important for adapting agricultural systems towards better utilizing substrates not edible for humans while balancing economic constraints and societal acceptance. With its systemic interdisciplinary research strategy of analysing the "Animal AS a System" at all levels of the genotype-phenotype map, from molecules to population, and the "Animal IN a System" for their responsiveness and adaptation to their specific environment, the FBN is well positioned to provide knowledge-based solutions to these challenges.

FBN sees the following reasons for its funding as a non-university institution:

- FBN's institutional funding guarantees a long-term continuity in research. FBN has a core of permanent scientists and science support staff, which secures key competencies and permits a long-term pursuit of complex questions.
- Through the research matrix, interdisciplinary teams of researchers address the complexity of both the biological systems and the tasks for the design of a sustainable livestock husbandry.
- The matrix structure also provides flexibility in allocating resources and adjusting organisational structures to ensure highly topical research. The flexible organisation enables ongoing quality control and strict alignment of research with the criteria laid down by FBN in its independent research strategy.
- FBN's institutional funding allows for an exceptional equipment and infrastructure and related expertise. The further development of the FBN's infrastructure is an integral part of strategic research. The FBN has created the prerequisites to make its infrastructure accessible to external scientists within the framework of services.

2. General concept and profile

Development of the institution since the last evaluation

Change in the director's position

The last evaluation of the FBN took place in 2015 (see chapter 6 for the recommendations of the last evaluation). Shortly after the on-site visit in March 2015, the former Director

retired. The position was internationally advertised as a dual role along with Chair of Animal Breeding and Genetics at the Faculty of Agricultural and Environmental Sciences of the University of Rostock. In October 2016, the Head of FBN's Institute of Genome Biology was appointed new Director of the FBN. He has been the acting Director since 2015.

Changes on the level of Institutes

At the six Institutes of FBN the following changes were made (see chapter 3 for details):

1. Institute of Genetics and Biometry: Since 2015, the Research Unit Biomathematics and Bioinformatics and the Service Unit Statistical Consulting got new Heads. The Institute still consists of two Research Units, two Junior Research Groups and two Service Groups. The Head is adjunct Professor ("außerplanmäßiger Professor") at Kiel University since 2006.
2. Institute of Genome Biology: In 2015 the former Head of the Institute became Director of FBN (see above). The Head of the Research Unit Genome Physiology has been Deputy Director since 2014 and became new Head of the Institute in 2018. The Head of one Junior Research Group was tenured. In 2018, a new service group was established. The Institute now consists of five Research Units and one Service Group. The Head is jointly appointed W2-Professor at Rostock University since 2014.
3. The Institute of Reproductive Biology: Since 2015 there is one new Junior Research Group. The Institute now consists of three Research Units, one Junior Research Group and one Service Group. The Head is Lecturer ("Privatdozent") at Rostock University.
4. The Institute of Behavioural Physiology: Since 2015 one Head of a Junior Research Group was tenured. The Institute now consists of two Research Units. The Head is jointly appointed W2-Professor at Rostock University since 2011.
5. The Institute of Muscle Biology and Growth: Since 2015 one Junior Research Group and one Work Group have been established. At the same time, one Research Unit and one Junior Research Group have been discontinued. The Institute now consists of two Research units, one Work Group, one Junior Research Group and one Service Group. The Head is adjunct Professor at Martin Luther University of Halle-Wittenberg since 2011.
6. The Institute of Nutritional Physiology: Since 2015 one Service Group has been established and one Work Group has been closed. The Institute now consists of three Research Units and one Service Group. The Head is adjunct Professor at Rostock University since 2017.

Furthermore, since the last evaluation FBN established one Core Facility and one Independent Research Group.

Changes on the level of Programme Areas

Since the last evaluation, the FBN has developed new Programme Areas to refine its research profile. In the FBN Research Matrix, the new Programme Areas and their projects aim at short- and mid-term, interdisciplinary research objectives that the teams of the six permanent, discipline-oriented Institutes of the FBN are working on. In order to foster

scientific exchange Clusters have been formed within the Programme Areas. The following structure was implemented:

Programme Area 1: Biodiversity and Adaption *(Speakers: Head of the Institute of Genetics and Biometry and Head of the Institute of Nutritional Physiology)*

- Cluster 1.1: Development and Programming (8 Projects)
- Cluster 1.2: Physiological and Genetic Biodiversity (6 Projects)
- Cluster 1.3: Estimation, Modelling and Annotation of Genomic Variation (4 Projects)

Programme Area 2: Animal Welfare and Animal Health *(Speakers: Head of the Institute of Genome Biology and Head of the Institute of Behavioural Physiology)*

- Cluster 2.1: Etho-physiological Adaptation and Welfare (5 Projects)
- Cluster 2.2: Disease and Immune Response (6 Projects)
- Cluster 2.3: Metabolic Health (5 Projects)

Programme Area 3: Resource Utilisation and Environmental Interactions *(Speakers: Head of the Institute of Reproductive Biology and Head of the Institute of Muscle Biology and Growth)*

- Cluster 3.1: Nutrient Conversion and Energy Metabolism (4 Projects)
- Cluster 3.2: Cellular and Tissue-Crosstalk and Nutrient Signals (4 Projects)
- Cluster 3.3: Animal-Environment Interactions (5 Projects)

In view of the FBN, the concept of Programme Areas enhances the systemic research approach. In this long-term Research Strategy, the animal itself is considered as a biological system (*Animal AS a System*) in order to clarify the physiological and genetic basis of trait manifestation and variation. To this end, animals are investigated at all levels of the genotype-phenotype map, and from molecules to population.

To investigate the ethological and physiological needs of animals, the mechanisms of genotype-environment interaction, and the mediating epigenetic changes in animal-environment interactions, the animal is analysed within its specific environment (*Animal IN a System*). In this context, the FBN specifically focusses on the animal-intrinsic elements of complex animal-environment interactions.

Results

Research

In the period 2015-2017, FBN scientists contributed more than 480 publications, 81% of them in peer reviewed journals (see Appendix 2 for details). According to FBN, in the period 2015-2017 the number of publications per year is on the same level than in the period 2011-2013, but the quality of publications has improved. There was a substantial increase of the number of publications with impact factors >3. The average impact factor (IF) sum per researcher per year in the period 2015-2017 was 6.1, while in the period 2011-2013 it was 3.6. FBN scientists were corresponding authors and co-authored publications in high-ranking journals related to the specific expertise of the FBN researchers

(e.g.: Aging Cell, Global Change Biol, Philos Trans R Soc Lond B Biol Sci, Proc Natl Acad Sci (USA), Science, Semin Immunopathol).

The publication strategy promotes publication in the top 25 % of journals of the categories (1) 'Agriculture, Dairy and Animal Science', (2) other life sciences or (3) 'Multidisciplinary Sciences'. The revised publication concept includes additional motivation to publish in journals with IF >5 by awarding additional research funds to first, senior and corresponding authors. Moreover, the FBN's publication strategy supports the open data concept and publication in open access journals providing a budget covering associated costs.

Some research highlights in the period 2015-2017 were:

- The FBN identified a causal variant for a genetic defect as a consequence of a spontaneous mutation that violates the fundamental mammalian seven-cervical blueprint that was highly conserved for more than 200 million years, and does not preclude reproduction of the affected individual (Kromik et al. (2015), Genetics 199 (3): 873-883).
- Combined proteome and targeted RNA analyses in the bovine revealed that the sensitivity of thyroid hormone signalling is regulated by ambient heat depending on the physiological state, which ensures the amino acid supply to the foetus and the placenta, and minimizes the increase in endogenous heat during lactation (Weitzel et al. (2017), J. Endocrinol 234 (2): 129-141).
- A transgenic insulin-like growth factor-binding protein-2 mouse model revealed that one single methylene group is sufficient to control lifespan, reproductive development and energy metabolism, and that these effects depend on integrin- but not on IGF-signaling. Transferred to farm animals, this implies that somatic growth is not an effector of lifespan (Hoeflich et al. (2016), Aging Cell 15 (1): 111-117).
- Integrating genome-wide association and expression QTL analyses for traits related to animal personality and coping style as basic concepts for evaluating animal welfare revealed novel positional and functional gene candidates for coping behaviour and evidenced links to circadian rhythmicity (Ponsuksili et al. (2015), Sci Rep 5: 16264).

Moreover, the FBN contributed innovative solutions and novel analytic tools for research and practical application (e.g.: signal feeding, new cell culture models for embryogenesis and myogenesis research, new ELISA for non-invasive detection of gastrointestinal nematode infection).

Scientific services and infrastructure tasks

In reaction to a recommendation of the last evaluation and as the result of consultations of an inter-ministerial working group and in the Board of Curators, the FBN Statute has been amended as follows: "*The purpose of the foundation is basic research and applied research in the field of the biology of farm animals as well as scientific services*". This has enabled the FBN to provide scientific services since October 2017. Scientific services comprise laboratory analyses and animal experiments using infrastructure and expertise in response to external requests in the form of research or service contracts. The animal

experimental facilities as well as the laboratory equipment and corresponding expertise of the FBN's scientific and technical staff are made available to external users. In particular, the Animal Technical Centre (including the respiratory chambers, the large animal surgery room and the experimental physiology rooms in connection with the stable isotope tracer and nutrient analysis labs featuring nutrition and metabolism research located in the Institute of Nutritional Physiology building), the behavioural arena in the Experimental Cattle Facility, the bioacoustics lab in the Experimental Pig Facility, the abattoir with meat research service, and the metabolomics platform are advertised on FBN's website and in brochures. The service concept is integrated into the Knowledge and Technology Transfer (KTT) strategy described below.

An administrative framework was established to provide infrastructure and services, which includes guidelines for access, contract solutions, service fees and warrantees, and a service catalogue. To achieve this, a BMBF funded project 'Model for cross-institutional services for knowledge and technology transfer in regional networks', coordinated by the FBN was acquired which includes all five Leibniz Institutes of Mecklenburg-Vorpommern. The FBN's respiration chambers, bioacoustics laboratories, and the metabolomics platform serve as example infra-structures. In addition, the EU cattle infrastructure project 'SmartCow' provides transnational access to infrastructures in Europe and defining European standard operation procedures for research on ruminants. The FBN belongs to a core group of European research institutions (INRA, France; University of Aarhus, Denmark; IRTA, Spain) currently preparing a proposal for a complementary EU pig infrastructure project.

Knowledge and technology transfer

Between 2015 and 2017 8 patents were registered and 2 patents were granted (see appendix 2). FBN currently holds four patents, two of which are licensed out. Another 14 patents are pending.

While basic and applied research is FBN's primary task, the new Statute forms the basis for providing scientific services. The FBN has acquired 850 K€ in extramural funds to establish professional Knowledge and Technology Transfer (KTT) structures and support strategies. A KTT service unit has been established, responding to internal and external requests. The activities of the KTT service unit range from technology transfer and information on research infrastructures to knowledge transfer to governmental and non-governmental stakeholders.

Since 1993, the FBN publishes the international scientific journal 'Archives Animal Breeding'. It has been included in the Journal Citation Report for more than 20 years (Impact Factor 2017: 1.2). Recent advances were the acceptance of the journal into the Directory of Open Access Journals (DOAJ) and into the index PubMed (technical implementation in progress). Furthermore, 'Archives Animal Breeding' received the DOAJ Seal, which recognizes journals with an exceptionally high level of publishing standards and best practices.

Research results are also communicated to potential users in training courses. For example, several FBN employees have been involved in seminars for representatives of German

animal breeding companies to support the zootechnical use of the results of national genome analysis projects in cattle and pigs.

Scientific consultancy

According to the FBN Statute, scientific consultancy is not a major task of FBN. Nevertheless, FBN employees are involved in more than 50 scientific committees as well as in advising industry and politics at regional, national and international levels.

Conferences and main events held at the institution

In 2015–2018, the FBN organized 17 scientific events with more than 1,500 participants. During 2015-2018, FBN scientists delivered 47 keynote speeches at international conferences.

Public relations

The operational organisation of the public relations work follows the PR strategy of the FBN and is carried out by the Public Relations Working Group, which comprises two representatives from each Institute and representatives of the doctoral students and the Animal Experimental Facilities Group, and is headed by FBN's press officer. The FBN published 56 press releases during 2015–2018 with broad media coverage (> 1000 registered reports in journals, magazines, radio and TV).

Guided tours for visitors are an important public relations tool. In 2015-2018, FBN organized 92 tours for more than 2,700 visitors from various countries (e.g.: Brazil, China, Taiwan, Vietnam, USA, Southern Sudan). Every other year, FBN organizes an Open Day on campus. In 2016, about 3,000 visitors were welcomed. In October 2018, FBN was intensely involved in celebrating the state harvest festival in Dummerstorf with more than 20,000 visitors, in lieu of the regular Open Day in 2018. Both events received broad media coverage.

Strategic work planning for the next few years

Planning on the level of Institutes and Research Units

In addition to the Director (W3) and the Deputy Director (W2) also the Head of the Institute of Behavioural Physiology has been jointly appointed as Professor with the University of Rostock (W2 in 2011). In addition to these three joint appointments FBN plans to fill the following four executive positions (permanent appointments as Professors and Heads of Research Units, appointment as Heads of Institutes for five years with possible extension) in joint appointments (W2) with the University of Rostock:

- Head of the Research Unit Fish Genetics in the Institute of Genome Biology (Professorship 'Molecular Biology and Genetics in Fish'),
- Head of the Research Unit Experimental Reproductive Biology in the Institute of Reproductive Biology (Professorship 'Animal Biotechnology'),
- Head of the Research Unit Nutritional Programming in the Institute of Nutritional Physiology (Professorship 'Biochemistry of Nutrition'),

- Head of the Research Unit Livestock Genetics and Breeding in the Institute of Genetics and Biometry (Professorship 'Statistical Methods').

Furthermore, a Professorship 'Smart Livestock Agriculture and Process-Engineering' at the University of Rostock is planned with a double affiliation linked to the planned Service Group Smart Livestock Farming at the FBN.

Planning on the level of Programme Areas

In view of FBN, research is increasingly necessary on biomarkers for behaviour, animal welfare, and (metabolic) health, epigenetic and epistatic mechanisms, host-microbiota-environment interactions: Furthermore, FBN considers utilisation of big data, implementation of smart farming, systems biology approaches to integrate omics-data, and more refined and new breeding methods as important research topics. . These issues are addressed in the new Programme Areas, and will remain a focus in FBN's long-term research strategy, which considers the 'Animal AS a System and IN a System'. In particular, the FBN will tackle the following topics:

- Comprehensive characterisation of farmed animal behaviour, social interactions and coping with different environments, and elucidation of genetic and indirect genetic effects on behaviour and welfare.
- Understanding mechanisms of adaptation, genome/environment interactions, and factors defining resilience within and across environments.
- Systematic analysis of phenomena of programming and epigenetic mechanisms to understand the interaction of the farmed animal with its environment to optimise performance, resource efficiency and animal health.
- In-depth exploration of the host-sided aspects of the crosstalk between animal hosts and microorganisms (pathogens, commensals or symbionts)/microbiota (extending beyond the ruminant microbiome and intestinal microbiome).
- Exploring the use of novel species, such as insects and aquatic species to convert biomass, and their intrinsic needs and capabilities.
- Development of processes and methods (e.g.: 'deep learning') to use 'big data/smart farming', particularly with regard to high-throughput phenotyping.
- Exploration of advanced genetic methods (systems biology, genome editing, statistical methods) to breed farm animals, e.g.: with respect to efficiency and disease resistance.

Application for additional funds to establish a new group "Live imaging"

FBN plans to purchase a magnetic resonance imaging (MRI) scanner and establish a new group "Live Imaging". The MRI allows for spatial and temporal high-resolution insights into structure and function of intact organisms. This includes anatomical images of organs as well as functional or metabolic imaging to perform dynamic investigations, explore brain activity or follow up on and quantify metabolic processes. With an MRI, the FBN expects to bring its strategy of deep phenotyping research to a completely new level. This technology would also strengthen FBN's role in the framework of EU infrastructure projects like the running EU cattle infrastructure project "SmartCow" project and a currently

prepared EU pig infrastructure project. This also links to the novel DFG priority programme 'Radiomics: next generation of biomedical imaging'.

The establishment of the new group requires a total investment in 2022 of 3.45 M€. This includes:

- 3.3 M€ for a 3 Tesla scanner and the expenses for the necessary building reconstruction and technical safety measures in order to host the instrument as well as costs for energy/consumables
- 150 K€ for the salary in 2022 of scientific seed personnel (e.g. two positions for a medical physicist and a technical assistant, TV-L E14 and E9).

In order to establish the new group FBN plans to apply for a temporary increase in its institutional funding (temporary extraordinary item of expenditure/*temporärer Sondertatbestand*) in 2022. After 2022, the running costs and salaries are covered from FBN's own budget. The following table shows the financial plannings:

	2022	**permanent**
***Sondertatbestand* =** Own contribution + Additional means	**3.45 M€**	**0.2 M€**
Own contribution (min. 3 % of institutional funding)	0.65 M€	0.2 M€
Additional means of institutional funding	2.8 M€	0

Appropriateness of facilities, equipment and staffing

Funding

In 2017, FBN's institutional funding was approx. 23.7 M€ (see appendix 3).

Additionally, 2.2 M€ were obtained from revenues from project grants (corresponding to 10 % of the overall budget). The revenues split into 610 K€ from federal and *Länder* governments, 530 K€ from the DFG, 510 K€ from the EU, and 400 K€ from industry. In the mid-term, FBN is aiming for revenues from third-party funding corresponding to 20 %, in the longer term to 25 %. The improved third-party fundraising with more than 3.6 and 4.5 million in 2017 and 2018 will cumulate to increased third-party revenues and expenditures.

Buildings and animal facilities

The buildings and facilities have been renovated or replaced with a total investment of approximately 50 M€ since the establishment of the FBN in 1993. Since 2015, further renovations and modifications of buildings have taken place.

The FBN has special infrastructure units due to the provision of research-oriented animal stocks. These include the Animal Technical Centre (2003), the Model Animal Laboratory operated under specific-pathogen-free conditions (2011), the Experimental Facilities for cattle (2012), pigs (1998), poultry (2015), goats (2014), aquaculture (2017) and the EU-approved abattoir (2003). With the completion of the Experimental Poultry Facility and the Experimental Aquaculture Facility further experimental animal infrastructures have

been created in the reporting period, which allow the FBN to undertake detailed, comprehensive and competitive research in a variety of farmed animals. As well, constructions of installations for keeping insects for feed and food were completed end of 2018 in the Animal Technical Centre. At present, the Experimental Facilities for pigs, built in 1998, is being expanded with a 'project barn' for 362 pigs that will replace a dilapidated stable. Following the completion of these major construction measures, the FBN's construction and renovation programme, which began in 1995, will be fully implemented.

Scientific instrumentation and IT

The Institute has a number of large-scale facilities and special laboratories. The latter includes laboratories for whole-body energy measurements of large farm animals in respiratory chambers, for quantitative bioacoustic measurements; for genome, transcriptome, proteome and metabolome analyses; for cell and tissue culture; for stable and radioactive isotopes; and special laboratories for video evaluation as well as for quantitative histological and cytometric measurements. In addition, demanding surgical procedures can be performed on large and laboratory animals in the operating rooms of the veterinary laboratory. Equipment investments of 3.07 M€ were made since the last evaluation, of which 0.72 M€ were spend for information technology (IT).

Four IT specialists of the unit Information Technology are responsible for implementing the IT concept. Together with the six IT coordinators of the Institutes, they form FBN's IT Commission. All facilities, including the experimental animal facilities, are integrated into an IT infrastructure, based on a campus-wide data network. The IT infrastructure provides a basis for research data management.

Scientific library

The FBN's public scientific library contains special and basic literature on biology, genetics, biochemistry, physiology, animal nutrition, animal husbandry, animal breeding, veterinary medicine and other sub-disciplines. The stocks are searchable via the GBV Union Catalogue and the Electronic Journals Library, and are available for national and international library loan. The library is equipped with about 45,000 bibliographic units (books, ebooks, journals, theses). More than 5,500 subscription journals with national licenses can be accessed online via the FBN intranet. In addition, the library provides access to a number of subject databases.

For personnel see chapter 4 and appendix 4.

3. Institutes of FBN

3.1. Institute of Genetics and Biometry

(6.7 FTE in Research and scientific services, 2.0 FTE postdoctoral researchers on grants or fellowships, 4.45 FTE doctoral candidates, 13.85 FTE Service as of 31.12.2017)

The Institute undertakes methodical research in the field of biostatistics, mathematics and bioinformatics that can help to answer fundamental and applied questions of modern livestock genetics. It develops methods with accompanying software that help analyse

high- and low-throughput biological data. Special interest lies in the genotype-phenotype relations, chronobiology, parent-of-origin effects and linkage-disequilibrium between markers in various population types.

Between 2015 and 2017 the Institute published 75 peer reviewed original articles. In the same period, the Institute received third-party funds amounting to approx. 620 K€. 500 K€ were obtained from the Federal and *Länder* governments and 110 K€ from the DFG. The Institute comprises the following units:

- Research Unit "Livestock Genetics and Breeding" (like most Research Units the Unit exists since the introduction of Research Units in 2013)
- Research Unit "Bioinformatics and Biomathematics " (since 2013, new head since 2016*)*
- Junior Research Group "Genome-based Phenotype Prediction" (since 2013)
- BMBF-funded Junior Research Groups 'Phenotyping of Animal Welfare' (2013 till 2019, new head since 2016)
- Service Group "Statistical Consulting" (since 2013, new head since 2018)
- Service Group "Lab Animal Facility" (since 2012)

The 'Livestock Genetics and Breeding' Unit developed methods for addressing whether parent-of-origin effects and genomic imprinting are relevant for the genetic variation of quantitative traits with agricultural importance. A published model was reengineered into two kinds of equivalent models. Further generalisations of the approach will be subject of a follow-up project funded by the German Research Foundation (DFG). The Unit also continued its research related to linkage disequilibrium between markers.

In 2016, the new Head of the 'Bioinformatics and Biomathematics' Unit joined the Institute. He established two new programme budget-funded projects, both focusing on circadian (daily) rhythms in animals and related statistical methods. The aim is to understand animal health and longevity, and to design the best possible husbandry.

The Junior Research Group 'Genome-based Phenotype Prediction' further developed methods to estimate recombination rates between pairs of molecular markers on the bovine genome. The group was positively evaluated by external referees in early 2018. Two follow-up projects are funded by the DFG. Moreover, a joint project with the 'Fish Genetics' Research Unit (Institute of Genome Biology) started to study the pike-perch genome and to draft a genetic map based on commercial large-scale population data. The project is funded by European Maritime Fisheries Fund. Depending on the availability of positions, the group is to be converted into a Research Unit 'Statistics in Genomics'.

The 2013 established BMBF funded Junior Research Group 'Phenotyping of Animal Welfare' was taken over by a new Head in 2016. In collaboration with the Institute of Behavioural Physiology the group continued its work on automatically tracking the positions of cows in the barn and methods for deriving patterns of interactions between animals therefrom. The group will end its work in 2019.

The Service Group 'Statistical Consulting' gives advice for planning of experiments, modelling, analysis of data, and interpretation of the statistical results. It is resourced with personnel from all units of the Institute. In 2018 a new Head took over after the retirement of the former Head. The group is involved in a large number of publications with researchers from other FBN-Institutes. A member of the Service Group represents the Institute in the 'Working Group on Agricultural Statistics' of the German Region of the International Biometrical Society.

The Service Group 'Lab Animal Facility' is responsible for the maintenance of the Dummerstorf long-term selection mouse lines. The up to 6,000 mice are kept in a specific pathogen-free environment with defined hygienic conditions. Since the 70s the Dummerstorf long-term selected mouse lines have continuously been developed, providing valuable resource populations for investigations of growth, endurance and fertility. The main areas of interest are the regulation and investigation of the physiological mechanisms of growth and differentiation, fat and muscle development, reproductive fitness and life expectancy. Long-term selected mouse lines and transgenic mouse models are used to elucidate the physiological and genetic principles that underlie the regulation of animal performance.

3.2. Institute of Genome Biology

(12 FTE in Research and scientific services, 6 postdoctoral researchers on grants or fellowships, 5.55 FTE doctoral candidates, 18.54 FTE Service as of 31.12.2017)

The Institute researches the genome structure, annotation, regulation and function of farmed animal species and laboratory animal models. The focus is on functional (epi)genetic and genomic variations and functional networks modulating disease resistance and immune response, nutrient conversion as well as metabolic and environmental adaptation. By exploring the functional (epi)genomic background of phenotypic diversity, and performing holistic and targeted analyses from the cellular to animal to microbial population level the work aims at contributing to new visions for farmed animal-based bioeconomy and One Health concepts.

Between 2015 and 2017 the Institute published 145 peer reviewed original articles. In the same period, the Institute received third-party funds amounting to approx. 1.8 M€. 900 K€ were obtained from the EU, 380 K€ from the Federal and *Länder* governments and 290 K€ from the DFG. In 2018, further grants of 1.5 M€ (83% EU and DFG) were obtained in addition to a recent successful EU H2020 project application as coordinator of a large network proposal on Functional Annotation of Animal Genomes together with 20 European and global partners. The Institute comprises the following units:

- Research Unit "Genomics" (since 2013)
- Research Unit "Genome Physiology" (since 2013)
- Research Unit "Functional Genome Analysis" (since 2013)
- Research Unit "Signal Transduction" (since 2013)
- Research Unit "Fish Genetics" (since 2013)
- Service Group "Sanger and NextGeneration Sequencing" (since 2018)

The Research Unit 'Genomics' combines data from genotype, transcriptome and epigenome analyses with a broad spectrum of immune and endocrine, metabolic and behavioural parameters to address its primary research focus: the identification of functional genome elements, including genes and (epi)genetic variants mediating genotype-environment interaction and promoting adequate adaptive responses to challenges in pigs and chickens. The Head of the Research Unit became Director of FBN in 2016.

The Research Unit 'Genome Physiology' focusses on the genetics of disease resistance and the non-coding landscape of the bovine genome and transcriptome. Their structure and function in regulating nutrient transformation, environmental challenge and host-pathogen interaction, particularly the interplay of innate immune system and energy metabolism, are investigated through pipelines integrating bioinformatic analyses, deep phenotyping and newly developed laboratory methods. The Head of the Research Unit became Head of the Institute in 2018.

The 'Functional Genome Analysis' Research Unit focusses on understanding the function and regulation of genes and gene products in multi-omics datasets from genome/epigenome, transcriptome, metabolome and phenome in a holistic view of biological processes and their causal pathways associated with behaviour, metabolic type and adaptive immune competence traits.

Primary research targets of the Research Unit 'Signal Transduction' are the pleiotropic effects and biomarker potential of hormones regulating body weight, energy metabolism, reproductive traits or lifespan. These studies in mice including the FBN long-term selection mouse lines and in farmed animals both benefit and intimately depend on the FBN's interdisciplinary approach.

A central priority of the Research Unit 'Fish Genetics' is the genomic analysis of molecular-biological effects of combined environmental stressors on growth, health, and adaptation capability of new and common aquaculture species. The Unit also focuses on the development of simple diagnostic procedures based on genomic, especially innate immune parameters for screening and maintaining the health and adaptation of fish.

The Service Group 'Sanger and Next-Gen Sequencing' was established in 2018 in order to bundle the sequencing services already provided for a long time by technicians and research engineers of the Institute.

Furthermore, the former Junior Research Group 'Pathogen and cell type-specific immune response' explored the innate immune system in response to mastitis pathogens. In 2018, the group passed an external evaluation. To strengthen the new FBN international Research Group 'Epigenetics, Metabolisms, Longevity', the Head of the group was promoted to lead its laboratory.

3.3. Institute of Reproductive Biology

(9.0 FTE in Research and scientific services, 3.5 postdoctoral researchers on grants or fellowships, 3.45 FTE doctoral candidates, 14.88 FTE Service as of 31.12.2017)

The Institute investigates key processes of reproduction at the clinical, physiological and molecular level, considering genetic variation and different environmental conditions.

The focus lies on reproductive phenotypes to generate new molecular targets for animal breeding that are relevant for reproductive health and fertility. Special emphasis is placed on genetic, metabolic and environmental conditions affecting gonadal function and gametogenesis as well as understanding mechanisms involved in the embryo-maternal dialogue in farm animals. The Institute's clinical expertise is maintained by two experimental veterinarians, enabling all groups to perform experiments in large animals as cattle and pigs.

Between 2015 and 2017 the Institute published 62 peer reviewed original articles. In the same period, the Institute received third-party funds amounting to approx. 570 K€, from which 390 K€ were obtained from the DFG. In 2018, additional grants of 850 K€ and 600 K€ from the Leibniz Association (together with Institutes of Genetics and Biometry and Genome Biology) and from the DFG, respectively, were newly approved. The Institute comprises the following units:

- Research Unit "Experimental Reproductive Biology" (since 2013)
- Research Unit "Reproductive Cell Biology" (since 2013, new head since 2014)
- Research Unit "Reproductive Biochemistry" (since 2013)
- Junior Research Group "Glycobiology" (since 2016)
- Service Group "Cytometry" (since 2013)

The 'Experimental Reproductive Biology' Unit is interested in the regulation of folliculogenesis and luteinization in dairy cattle and the influence of metabolic and/or environmental factors on these processes. In this context the impact of metabolic stress (e.g. postpartum negative energy balance), which is even aggravated under heat stress conditions, is studied in cell culture and animal models in molecular detail. Another focus lies on mechanisms of cycle control, implantation and pregnancy. Since 2017, the Unit hosts a Humboldt Fellow (formerly Penn State University, USA), who studies the effects of hypoxia during the folliculo-luteal transition.

The 'Reproductive Cell Biology' Unit is mainly interested in early embryo-maternal interactions, and established 3D culture models for epithelial cells of the female reproductive tract as tools to study the embryo-maternal dialogue. This part of the Unit's expertise is used by several projects within the FBN and beyond. In 2014 a new Head of the unit was hired.

The main research foci of the 'Reproductive Biochemistry' Unit are the impact of oxidative stress on fertility in dairy cows and the elucidation of regulatory processes during germ cell development to further unravel the reproductive phenotype of the Dummerstorf high fertility mouse lines. In 2015, the unit dealt with the departure of two senior scientists. Both had been working on the regulation of protein synthesis during implantation in pigs, a project that has been discontinued.

The Junior Research Group 'Glycobiology' was established in 2016 and is organizationally associated with the 'Reproductive Biochemistry' Unit (see above). The group is especially interested in glycans of the reproductive tract representing potential modulators of the immune system. Methodologies include structural characterization of glycoconjugates in

addition to the isolation of immune cells, primarily neutrophils, and their functional modulation by glycans.

The Service Group 'Cytometry', provides methods such as flow cytometric methods, fluorescence-activated cell sorting (FACS), histology, microscopy, confocal laser scanning microscopy, image cytometry, image analysis and live cell imaging. The group supports users and cooperation partners and develops the methods.

3.4. Institute of Behavioural Physiology

(8.0 FTE in Research and scientific services, 2.0 postdoctoral researchers on grants or fellowships, 4.15 FTE doctoral candidates, 9.93 FTE Service as of 31.12.2017)

The research area of the Institute encompasses the biological principles of farm animal behaviour in the context of animal welfare. The focus is on adaptation, stress, coping and emotional appraisal processes in the animal-environment interaction using ethological, cognitive, bioacoustic, cardiovascular, neuroendocrine and immunological approaches to understand and improve animal welfare.

Between 2015 and 2017 the Institute published 60 peer reviewed journal articles and 28 articles in edited volumes. In the same period, the Institute received third-party funds amounting to approx. 730 K€. 240 K€ were obtained from the DFG, 240 K€ from the Federal and *Länder* governments and 220 K€ from the EU. In 2018 the Institute received further third-party funds amounting to approx. 430 k€ (73 % EU and DFG). The Institute comprises the following units:

- Research Unit "Ethology" (since 2013)
- Research Unit "Psychophysiology" (since 2013)

The Research Unit 'Ethology' deals primarily with fundamental questions of behavioural processes and applied ethology problems in farm animals (mainly pigs, cattle and dwarf goats). This comprises investigations in three main areas: i) learning and cognitive abilities, focussing on the link between cognition and emotion, ii) individual and social developmental processes or coping strategies (personality, coping style), and iii) bioacoustics and affective-dependent autonomic regulation in the context of stress and welfare. Animal-technology interactions are analysed with regard to the transfer of fundamental knowledge into practical solutions. The Junior Research Group 'Affective Behaviour' was completed in 2016. An external scientific evaluation confirmed that the Head of the group had fulfilled the required tenure-track criteria of the FBN, after which she was fully reintegrated into the Research Unit 'Ethology'.

The Research Unit 'Neuroimmunology' was renamed 'Psychophysiology' in 2016 to better reflect its scientific work. It focusses on the characterisation of the regulatory processes of adaptation, coping and appraisal in animals, especially related to uncovering the underlying psychophysiological mechanisms. The primary areas of investigation include: i) the interactions between behaviour, neuroendocrine and immune systems, ii) the impact of psychosocial and physical stressors on affective states, and iii) consequences of these impacts for animal health and welfare. In addition to utilizing pigs as farm animal models,

cattle, goats, mice, and recently fish and poultry, were also included in research studies through collaborations within and outside of the FBN.

3.5. Institute of Muscle Biology and Growth

(7.63 FTE in Research and scientific services, 1.8 FTE doctoral candidates, 13 FTE Service as of 31.12.2017)

The Institute investigates cellular processes and regulatory pathways in skeletal muscle and associated tissues and their consequences for growth, meat quality and animal health. Myo- and adipo-genesis, cellular and tissue cross-talk as well as lipid metabolism and plasticity of skeletal muscle are in the focus of research.

Between 2015 and 2017 the Institute published 45 peer reviewed original articles. In the same period, the Institute received third-party funds amounting to approx. 590 K€, which were obtained almost entirely from industry. The Institute comprises the following units:

- Research Unit "Cellular Interactions" (since 2013)
- Research Unit "Growth and Development" (since 2013)
- Work Group "Lipid Metabolism and Muscular Adaptation" (since 2018)
- Junior Research Group "Fish Growth Physiology" (since 2018)
- Service Group "Experimental Abattoir and Meat Research Service" (since 2007).

The Research Unit 'Cellular Interactions' continued its work on unravelling the molecular basis of intramuscular adipogenesis in bovine species, but it became increasingly interconnected with the work on adipokines and myokines in farmed animals. Another focus lies on the identification and characterisation of signalling molecules secreted by myocytes, adipocytes and other cell types as a basis for targeted interventions.

The Research Unit 'Growth and Development' has increasingly concentrated its research on the role of satellite cells in early postnatal myogenic processes. Work on regulatory effects of mitochondrial functionality and metabolic status on the establishment of heterogeneous satellite cell subpopulations as a prerequisite for muscle plasticity, and on satellite cell fate has become an important topic. The exploration of regulatory processes underlying intrinsic differences in stem/satellite cell functionality and the identification of targets for further analysis was started by implementing proteomics studies and using pig models characterized by impaired muscle development. Interactions between skeletal muscle development and components of the immune system became a new topic in the Research Unit.

The Work Group 'Lipid Metabolism and Muscular Adaptation' aims to provide deeper insights into the links between lipid metabolism and muscular growth and differentiation processes. The group was established in 2018 after the leader of the Junior Reseach Group 'Cellular Lipid Metabolism' left the FBN in 2016. She was also acting Head of the Research Unit 'Function of Bioactive Lipids', which was discontinued.

By establishing the Junior Research Group 'Fish Growth Physiology' in 2018, the strategic orientation and competence of the Institute was extended to the area of aquaculture. Its

work complements the molecular genetic research of the Research Unit 'Fish Genetics' (Institute of Genome Biology).

The Service Group 'Experimental Abattoir' provides expert service in slaughtering, dissecting and phenotyping experimental animals. The abattoir is certified for cattle, pigs, sheep and chicken according to EEC regulations. The abattoir is now member of the 'Initiative Tierwohl'. Carcass and meat quality traits provided by the Group and the meat quality laboratory were part of deep phenotyping of all experimental animals.

3.6. Institute of Nutritional Physiology "Oskar Kellner"

(9.0 FTE in Research and scientific services, 1.0 postdoctoral researcher on fellowship, 4.9 FTE doctoral candidates, 15.95 FTE Service as of 31.12.2017)

The Institute researches the requirements, allocation and metabolization of nutrients and the regulation of associated physiological processes in farmed animals, focussing on the effects of nutrition in early developmental phases on later performance and health, greenhouse gas emissions from ruminants, as well as feed intake regulation, energy and protein metabolism and the efficiency of farmed animals under varying environmental conditions. The Institute is responsible for the management of the Animal Technical Center.

Between 2015 and 2017 the Institute published 90 peer reviewed original articles. In the same period, the Institute received third-party funds amounting to approx. 1.5 M€. 810 K€ were obtained from industry and 580 K€ from Federal and *Länder* governments. In 2018 additional grants of 1.6 M€ (70% EU and DFG) were obtained. The Institute comprises the following units:

- Research Unit "Nutritional Programming" (since 2013)
- Research Unit "Endocrine Metabolic Regulation"(since 2013)
- Research Unit "Metabolism Efficiency" (since 2013)
- Service Group "Stable Isotope Tracer and Nutrient Analytics" (since 2018)

The Research Unit 'Nutritional Programming' focusses on the exploration of perinatal nutritional effects on development, metabolism, the innate immune system, and epigenetic mechanisms in the short and medium term in pigs, chicken and mice. Furthermore, modulations of host-parasite interactions in chicken in respect to genotype/performance and nutrition are investigated. The former Work Group 'Cellular Nutrient Signalling' was closed in 2018 and its Head was relocated to the Research Unit on order to strengthen the expertise in nutrient signalling and take over responsibilities in the new working group 'Insects as feed and food'..

The Research Unit 'Endocrine Metabolic Regulation' investigates the importance of nutrients and non-nutritive, bio-active substances, especially from colostrum and milk supply, on intermediary metabolism, health, immune system and feeding behaviour in pre-weaning calves. The Research Unit also examines metabolic stress of dairy cows around calving, its dependence on nutrient supply and in different genotypes.

The Research Unit 'Metabolism Efficiency' prioritizes its research on the investigation of feed efficiency in dairy cows with divergent phenotypic traits including mechanisms of

feed intake regulation, intermediary metabolism, methane emission and nitrogen losses. The Research Unit also focusses on metabolic adaptation and cellular immune responses of dairy cows exposed to environmental heat.

The newly established Service Group 'Stable Isotope Tracer and Nutrient Analytics' utilizes the knowledge and expertise accumulated over the last 15 years by the scientists of the Institute on the basis of chromatographic and mass spectrometric techniques to provide analytic services on parameters of the functional quantitative nutrient metabolism for internal and external collaboration.

3.7. Units directly reporting to the director

i) Independent Research Group "Epigenetics, Metabolism and Longevity"

This Research Group was set up in 2018 to strengthen and deepen current research on epigenetics and programming. The group is staffed with a head, a senior researcher, a doctoral candidate and a technician. It addresses the triangle of metabolic status, epigenetic modifications and events of early aging affecting cognitive functions and response to environmental stress. Behavioural and metabolic experiments in mice, including the Dummerstorf long-term selection lines, and drosophila are complemented with advanced mass spectrometry and biochemical methods. Results from model organisms will be linked to farm animals and translated to understand epigenetic mechanisms that affect metabolic performance and longevity.

ii) Core Facility "Metabolomics"

The Core Facility 'Metabolomics' was founded in 2018 in order to provide service to researcher of the FBN and outside the FBN. Integrating the analytical equipment existing at the Institutes of Muscle Biology and Growth, Nutritional Physiology and Genome Biology and new equipment the Core Facility will provide non-targeted metabolic analyses in routine and specific analyses of metabolites on demand.

4. Collaboration and networking

Collaboration with the University of Rostock

The partnership with University of Rostock includes joint appointments with the Faculty of Agricultural and Environmental Sciences (AUF). The Faculty Council of the AUF approved a proposal for the joint appointment of seven professorships with the FBN (one W3 and six W2). Three of these seven professorships have been filled so far:

- The Director of the FBN was appointed Professor of Animal Breeding and Genetics in 2016. Before that he was adjunct Professor at the University of Bonn.
- The Deputy Director and Head of Institute of Genome Biology was appointed Professor of Genetics of Disease Resistance in 2014.
- The Head of the Institute of Behavioural Physiology was appointed Professor for Behavioural Sciences in 2011.

For the plans for the additional four joint appointments with the AUF as well as one more professorship with double affiliation at AUF and FBN see chapter 2. Two employees of the FBN hold adjunct professorships at the University of Rostock:

- The Head of the Institute of Nutritional Physiology is adjunct professor at AUF,
- The Head of the Research Unit Psychophysiology is adjunct professor at the Faculty of Mathematics and Natural Sciences.

The FBN collaborates with five Faculties of the University of Rostock within the Leibniz ScienceCampus 'Phosphorus Research Rostock'. The ScienceCampus further includes the Leibniz Institutes for Baltic Sea Research (IOW), for Catalysis (LIKAT), Plant Genomics and Crop Plant Research (IPK), and Plasma Research and Technology (INP). In this context, a joint graduate school was established in 2015 (see chapter 5).

The FBN collaborated with the AUF and the FLI Insel Riems as well as further 16 partners from five universities (Bonn, Giessen, Göttingen, Kiel, Munich) in the AgroCluster 'PHENOMICS' under the BMBF funding initiative 'Competence Networks in Agricultural and Nutrition Research'. A Junior Research Group at the FBN continues that research until 2019.

The FBN has initiated the Next-Generation Sequencing Consortium Mecklenburg-Vorpommern with the Institute for Biostatistics and Computer Science in Medicine and Aging Research of the University of Rostock.

FBN and AUF collaborate in the re-accredited (2018) interdisciplinary Master's programme 'Animal Sciences'. This four-semester programme is jointly organized by twelve FBN lecturers, five AUF lecturers and five lecturers from other institutions.

Collaboration with other Universities

FBN has been collaborating with University of Kiel for a long time, as formally documented in the agreement of 2007. This includes an adjunct professorship (Head of the Institute of Genetics and Biometry) and collaborative projects, among which is the AgroCluster 'FoCus – Food Chain Plus', a joint project funded within the framework of the BMBF initiative 'Competence Networks in Agricultural and Nutrition Research'.

The Head of the Institute of Muscle Biology and Growth is adjunct professor at the Martin Luther University of Halle-Wittenberg. Recently, the FBN concluded a collaboration contract with the University of Greifswald (2018) that offers the opportunity for joint appointments. The contract further regulates cooperation in research, teaching and the promotion of young scientists. The FBN also concluded a collaboration contract with the University of Hohenheim. Currently the FBN participates in the DFG Research Group FOR 2601 coordinated by the University of Hohenheim.

The FBN is linked by the appointments of 13 FBN scientists with 'Habilitation' as private lecturers to the Universities of Bonn, Giessen, Leipzig, Veterinary Medicine Hanover, FU Berlin. 35 FBN staff members teach at nine universities and hold more than 700 semester hours of courses.

Collaboration with other domestic institutions

Within the Leibniz Association the FBN is engaged in the Leibniz Research Alliances 'Biodiversity', 'Healthy Ageing', 'Sustainable Food Production and Healthy Nutrition', the Leibniz Network 'Mathematical Modeling and Simulation', as well as in the Leibniz ScienceCampus 'Phosphorus Research Rostock'.

The research coordination between FBN, the five other Leibniz Institutes assigned to the BMEL and the Departmental Federal Research Institutes of the BMEL takes place in the BMEL's "Research Steering Committee".

Collaboration with international institutions

In terms of contracted collaborations, the FBN has an agreement with the University of Natural Sciences and Humanities, Siedlce, Poland. Further collaboration agreements were concluded with the Federal Science Centre for Animal Husbandry, Moscow Region, Russia, the International Livestock Research Institute (ILRI), Nairobi, Kenya and Addis Abeba, Ethiopia and the Agricultural University of Nanjing, China. The scientific exchange programme with Canadian universities and research institutes (Guelph, Sherbrooke, Vancouver) has been intensified.

In total, 98 bi- and multi-lateral scientific collaborations are ongoing with 188 university and 125 non-university institutions. More than two thirds of these are carried out with international partners from 44 countries. In 2015-2017, the FBN published two thirds of all peer reviewed papers together with scientist from collaborating institutes. In the same period the FBN has participated in 24 applications of European consortia for funding in framework of H2020-, ERA-Net-, FACCI-JPI-, and EU-Cost Action calls also in a coordinating capacity, with a success rate of approximately one third. Recently, the FBN was successful as coordinator of a large H2020 network proposal on Functional Annotation of Animal Genomes together with 20 European and global partners.

Between 2015 and 2017, there were 67 guest stays (one week or longer) at the FBN (17 from German institutions). In the same period, FBN researchers made 24 visits to other institutions (three of those in Germany).

Other collaborations and networks

A collaboration agreement between the Leibniz Association and the Institute National de la Recherche Agronomique (INRA), France, is of particular importance to the FBN. The FBN and the Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB) established a relationship with INRA, in which there are reciprocal working visits. The FBN is conducting a research project with INRA partners funded by the bilateral programme of the DFG and ANR and collaborates in several multilateral European consortia (H2020, ERA-Net, EU-Cost Action). Similar bilateral projects are also ongoing with partners from Switzerland and Poland, cofunded by the DFG and foreign funding agencies.

The membership of the FBN in the Deutsche Agrarforschungsallianz (DAFA) and participation in the Steering Group on Animal Research as well as the role as spokesperson of

the DAFA in the ATF (Animal Task Force) contributes to the definition of future research programmes on a national and European level.

In addition to bi- or multilateral collaborative projects, FBN contributes to the accumulation of knowledge about farm animals and makes its infrastructure accessible to researchers worldwide. In the framework of the international '1000 Bulls project', as well as the FAANG and FAASG initiative the FBN provides resources and expertise towards annotating the farmed animal genomes and to developing research standards. In the framework of the EU project, 'SmartCow', the FBN enables access to its respiration chambers, stable isotope tracer methodology and behaviour arena, and supports external scientists with its expertise in cattle research.

5. Staff development and promotion of junior researchers

Staff development and personnel structure

On 31 December 2017, FBN employed 279 persons (without student assistants, trainees and scholarship recipients, see annex 4). 116 persons worked in research and scientific services (including 43 doctoral candidates), 121 persons had service positions (e.g. laboratory or animal care) and 42 persons had science management and administrative tasks.

The personnel concept specifies which research positions are intended to be permanent and which are used for qualification. In order to attract internationally recognised scientists, Heads of Research Unit positions are put out to tender internationally and the successful candidates receive permanent contracts. Other research positions which are to be occupied permanently are filled through the tenure-track procedure. The tenure-track guidelines contain professional requirements, performance-related requirements and personal requirements. Completion of the tenure-track term is evaluated by members of the Scientific Advisory Board and additional external reviewers. The remaining positions for research assistants are for qualification purposes or are only available for a certain period within the framework of third-party-funded projects.

Science-support positions are filled permanently, according to the analysis of demand in the personnel concept. Temporary requirements within the framework of substitutions or projects are covered by temporary employees. Temporary employees can be promoted to permanent positions by recommendation of the respective selection committee, and are given priority in the case of professional aptitude. In the area of technical staff and animal keepers, personnel requirements are covered by demand-oriented FBN vocational training. Additional demands of special professional expertise are covered by external recruitment.

Promotion of gender equality

The research-oriented equal opportunity standards of the DFG are applied by the FBN. As of 31 December 2017, out of the 116 employees in research and scientific services 66 were female (57 %, see appendix 4). Out of 22 leading scientists (one Director, six Institute Heads, 10 additional Research Unit Heads and 5 (Junior) Research Group Heads) 9 were female (41 %). Among the 36 scientists in non-executive positions were 20 women

(61 %). Out of 15 postdocs 8 were female (53 %). Out of 43 doctoral candidates 30 were female (70 %).

In 2014, the FBN was awarded the certificate 'berufundfamilie Service GmbH' for the first time after completing the audit procedure. The FBN was awarded the certificate for re-auditing on 31 May 2017.

Promotion of junior researchers

Between 2015 and 2017 27 doctoral students successfully completed their thesis at FBN. In the same period, FBN employees supervised a yearly average of 68 doctoral students. Doctoral candidates are supervised in accordance with the 'Guidelines for Doctoral Studies at the Leibniz Institute of Farm Animal Biology (FBN)' in collaboration with German universities. Generally, the FBN concludes a PhD agreement with all doctoral candidates, which fixes the compulsory PhD obligations and assures sound support.

Within the framework of the FBN training programme, key skills such as ethics, rhetoric, presentation, statistics, English language skills and leadership are taught - with particular focus on enhancing computer programming and language/presentation skills. Furthermore, the FBN organises structured seminars with internal and external experts, who introduce key fields of animal science. These seminars and courses are acknowledged by other universities, enabling FBN doctoral students to enroll in external PhD programs (e.g.: Dahlem Biomedical School, FU Berlin). In addition, under the collaboration agreement with University of Rostock, students can participate in its Graduate Academy with a variety of interdisciplinary courses, such as career planning, project management and patent exploitation. As well, under the framework of the Leibniz ScienceCampus 'Phosphorus Research Rostock', the FBN contributes to its Graduate School.

FBN launched a new programme granting additional FBN-funded PhD positions. The following award criteria for obtaining those positions were set up in an FBN-internal competition, in which all scientists could participate: i) joint submission of project proposals by Research Units from two Institutes and ii) reference of the doctoral projects to the Clusters of the Programme Areas, and iii) scientific quality. Following a decision by the Director and members of the Scientific Advisory Board, eight projects out of 13 proposals were selected, and eight additional doctoral positions were filled.

Postdoctoral researchers have access to consulting and support services from the FBN and its collaborating universities. The FBN offers a postdoctoral programme that includes workshops, retreats and training courses organized by the FBN as well as courses at University of Rostock, the Leibniz Association and other organizations. In addition, postdocs who wish to gain further qualifications are supported within the framework of an individual support programme. This includes financial support and sabbatical periods for specific training as well as scientific visits and internships at national and international partner Institutes. One particular promotional measure is the ongoing establishment of Junior Research Groups. Since the last evaluation, four Junior Research Groups were concluded and four are currently active, of which two are newly established since the last evaluation.

The Senate Strategic Committee project 'Protein Paradoxes: Protein Supply under the Conditions of Climate Change – Production, Consumption and Health' (2016–2020) of the

Leibniz Research Network 'Sustainable Food Production and Healthy Nutrition' was designed to promote postdoctoral researchers. It offers funding to help postdoctoral researchers of the partner institutes network through the use of project funds of the Leibniz Association.

The FBN participates in the postgraduate training of veterinarians. It is accredited as a training centre for veterinary specialists in animal reproduction as well as for additional qualifications in molecular biology. FBN staff members have a training authorisation for the above-mentioned specialist areas. Since the last evaluation, a specialist veterinary training course for reproduction and insemination was completed; one postdoctoral scientist finished the additional qualification in molecular biology.

Vocational training for non-academic staff

Science-support personnel are trained after a needs assessment in the respective structural units. Individual training courses on technical qualifications are offered. These are organized locally and according to requirements directly in the structural units. Training needs of FBN-wide interest (e.g.: computing, language courses) are organized centrally via in-house courses. In addition, employees receive ongoing training on current work standards, safety guidelines and standard procedures (e.g.: training on official carcass classification and meat quality determination).

The FBN offers training positions for biological laboratory assistants and cattle farmers. Between 2015 and January 2018, five trainees completed their vocational training. Since 2015, two new biology laboratory assistants have been hired annually on the basis of demand assessments for the coming years. In the other professional groups, trainees are hired depending on staffing demands. Due to the development of demand, an application was being made to provide vocational training for pig farmers and office management clerks.

6. Quality assurance

Internal quality management

The Science Committee is an internal body that monitors and evaluates ongoing FBN research projects, and evaluates and selects new research projects to be presented to the Scientific Advisory Board (see below). It also discusses and advises on current scientific issues and scientific organisational matters, projects within the framework of the Programme Budget and the use of experimental infrastructures and service facilities. Members of the Science Committee are the Director and the Institute heads.

In order to have a comprehensive overview on all scientific activities, data on the following items are continuously recorded in the Research Information and Research Data Management system, and monitored by the Science Committee: peer-reviewed publications (type, number, IF, open access), other scientific and academic activities (conference contributions, lectures, etc.), extramural funding applications and outcome.

In 2014-2018, between 1.15 M€ and 1.33 M€ per year were made available to researchers as core budget funds. During this reporting period, 40 % of these funds were allocated as

basic financing and 60 % as performance-based funding (previously 50:50). The performance-based allocation of funds is based on the criteria discussed in the Science Committee, approved by the Director and announced at least one year in advance. The criteria that are currently considered equally are (1) quantity of publications (number per scientist and year) and (2) quality of publications (IF sum per scientist and year), and (3) amount of extramural funding. Additional funds are awarded to the first, senior and/or corresponding authors of publications in journals with impact factors >5 to cover direct research costs within their Research Unit, and for inter-institutional publications. An additional performance fund is granted for coordinating EU projects within the framework of individual case decisions.

The rules of good scientific practice, combined with the activities of the Science Committee and of ombudspersons, are instruments of self-regulation of science. The 'Guidelines on safeguarding good scientific practice and procedures for dealing with allegations of scientific misconduct at the Leibniz Institute for Farm Animal Biology (FBN)' were implemented in 2002. A revised and expanded version includes sections regarding 'predatory journals' and 'predatory conferences'. The guidelines are based on the 'Principles for Safeguarding Good Scientific Practice' of the DFG Commission 'Self-Regulation in Science' and the corresponding recommendations of the Leibniz Association.

Part of safeguarding good scientific practice includes archiving according to Research Data Management Plans and administering registered laboratory notebooks. Research data must be secured and remain accessible for at least 10 years after their collection. Two RDM officers are responsible for providing the RDM framework and for supporting and training employees on RDM issues. The principles are described in the FBN Research Data Policy.

Quality management by the Scientific Advisory Board

The Scientific Advisory Board (SAB) provides independent, scientific, multidisciplinary and strategic advice to the Director and Board of Curators. The SAB meets once a year for two days.

In addition, the SAB audits the FBN in between evaluations by the Leibniz Association's Senate Committee on Evaluation. The aim of the audits is to evaluate the overall concept and the research activities of the Institutes, to review the progress in implementing recommendations of the last evaluation, and comment on future work plans. Since the last evaluation, the SAB carried out two audits (October 2016 and October 2018).

Implementation of recommendations from the last external evaluation

FBN responded to the recommendations made by the Senate of the Leibniz Association in the last evaluation (highlighted here in *italics*, see also Statement of the Senate of the Leibniz Association from 26 November 2015) as follows:

1) In order to develop more innovative topics and improve research performance, the FBN must receive considerably ***more external input****: in particular, a more intensive exchange of personnel with the international scientific community. In the past, vacancies in the scientific*

field were too often filled in-house; thus more international scientists should be employed at FBN.

All vacant research positions were advertised internationally. All vacant Head positions in Research Units, Junior Research Groups, and a Core Facility were filled with external, researchers.

In 2015, the FBN revised its internationalisation strategy to include international members in the Scientific Advisory Board, to introduce a secondment strategy for the consistent qualification and promotion of FBN researchers, to encourage visiting scientists at the FBN, and to recruit junior and distinguished senior researchers from abroad.

*2) The FBN has improved its **publication performance** since the last evaluation, but still lacks publications in higher and top-ranked journals. A more ambitious publication strategy should therefore be pursued. Overall, the publication performance of FBN must increase significantly.*

The FBN has overhauled its publication strategy putting emphasis on higher quality publications including the provision of additional funds to the first, senior and/or corresponding authors of publications in journals with impact factors >5. While maintaining the number of peer-reviewed publications the mean impact factor sum per scientist and year was increased from 3.6 (2011-2013) to 6.1 (2015-2017). With one exception all journals belonging to the field of 'Agriculture, Dairy and Animal Science' have an impact factor < 3.

*3) It is incomprehensible that the **outstanding infrastructure of the FBN can only be used to a very limited extent by external scientists**, which had already been criticised in the last evaluation. As is usual for Leibniz Institutes, scientific services that the FBN can and wants to provide should be developed and offered according to the possibilities and strategic goals of the Institute. If the Board of Curators sees an obstacle to implementing this important recommendation in the FBN's statutes, the statutes must be amended accordingly.*

The FBN statute was amended in October 2017. It now reads: "The purpose of the foundation is basic research and applied research in the field of the biology of farm animals as well as scientific services". This allows the FBN to provide scientific services.

*4) Although the amount of **third-party funding** has increased since the last evaluation (in 2013, it amounted to approximately EUR 2.5 million or 12.6% of total revenues), it is still too low in terms of the Institute's capabilities. In particular, more funds should be raised from the DFG and the EU in the future. The self-imposed goal of financing 15 to 20% of the total budget with third-party funds is not ambitious enough, even taking into account the high proportion of employees in the non-scientific sector (especially in the laboratory and animal care sectors).*

Between 2015 and 2017, FBN obtained on average approx. 2 M€ per year from revenues from project grants (10 % of the overall budget, see appendix 3). On average per year 0.6 M€ have been obtained from Federal and *Länder* governments (30 %), 0.5 M€ from Industry (25 %), 0.43 M€ from the EU (22 %) and 0.37 M€ from the DFG (19 %). In the mid-

term, FBN is aiming for revenue from third-party funding corresponding to 20 % of the overall budget, and in the longer term to 25 %.

According to documented grant approvals, in 2017 more than 3.6 M€ and in 2018 4.5 M€ have been raised corresponding to the mid-term goal of 20 %. EU and DFG funding reached a share of 32 % each.

5) It is welcomed that an agreement has been reached with University of Rostock to jointly fill up to five additional professorships (W2) in addition to the position of the Executive Director. According to the requirements of Leibniz Institutes, leading positions in the scientific field should generally be filled in a joint appointment procedure with universities. In the future, the FBN should link ***joint professorships*** *to the management of one of its six sub-institutes and advertise them accordingly.*

The partnership with University of Rostock has been further advanced. Now seven joint appointments with the Faculty of Agricultural and Environmental Sciences (AUF) are possible (one W3, six W2). Since the last evaluation, the Professorship of Animal Breeding and Genetics (W3, Director of the FBN) was completed in 2016. Four additional joint appointments and one double affiliation are planned (see chapter 2 and 5).

According to the new roles of proceedures vacant positions for institute heads are advertised internationally within the framework of joint professorships (according to the 'Jülich' or 'Berlin Model'). The professorships and the position as head of a research unit in the respective Institute are open-ended. However, based on the recommendations of the last evaluation (page B-19 of the evaluation report), the position of institute head is limited to 5 years with the possibility of extension. If a position of an institute head is not extended, the new head will be elected from among the heads of research units of the respective institute. The reason for this is that the former head is still active in a joint appointment at FBN and therefore neither FBN nor the university has any positions available for a new joint appointment.

6) Against the background of the size of the Institute, the outstanding scientific infrastructure as well as the improved university connections via the additional joint appointments, the FBN should further increase the number of ***doctoral students****. In addition, it is recommended to encourage young scientists to seek external follow-up employment after completing their doctorate in order to improve their scientific qualifications through new experiences at other institutions, if possible, also abroad.*

The number of doctoral candidates has been increased. Currently, 80 doctoral students are supervised by FBN scientists. Former FBN doctoral candidates increasingly occupy scientist positions or professorships at foreign universities, authorities and companies. Former doctoral or postdoctoral scientists have been appointed professors at national and international universities (e.g.: University of Göttingen, Norwegian University of Life Sciences, University of Guelph).

7) It is gratifying that the FBN acquired a graduate school as part of the Leibniz Association's competition procedure (2010–2013) with the universities of Kiel and Rostock. Based on the established structures and the cross-institutional further training offers already offered, ***a***

structured training framework *and long-term training policy* ***for all doctoral students*** *of the FBN should be developed.*

Doctoral students are supervised in accordance with the 'Guidelines for Doctoral Studies at the Leibniz Institute for Animal Biology (FBN)'. Within the framework of the FBN's structured and regular training programme, key competences such as ethics, rhetoric, presentation, statistics, English and leadership are taught (see chapter 5).

8) The establishment of the Junior Research Groups and the tenure-track procedure at the FBN is very welcome. So far, however, ***too many in-house candidates*** *have been hired for these positions despite international calls for applications. The FBN should base its procedures and criteria for filling tenure-track positions on internationally recognised standards, such as those applied in the DFG's Emmy Noether Programme or in the evaluation of junior professorships. In particular, it must ensure that the persons in question have gained several years of experience outside the FBN, preferably abroad. Whenever possible, external expertise beyond the FBN committees should also be included in evaluating candidates for permanent positions.*

The FBN has revised its regulations and criteria for the allocation of tenured positions(see chapter 5). In particular, before granting permanent positions, external expertise is sought from a member of the Scientific Advisory Board and an external renowned scientist in the respective field. As a rule, all these positions are advertised internationally. In 2015-2018, seven out of 13 tenured positions were filled with external candidates. Among them, two Heads of Junior Research Groups were appointed following the decision of a Selection Committee.

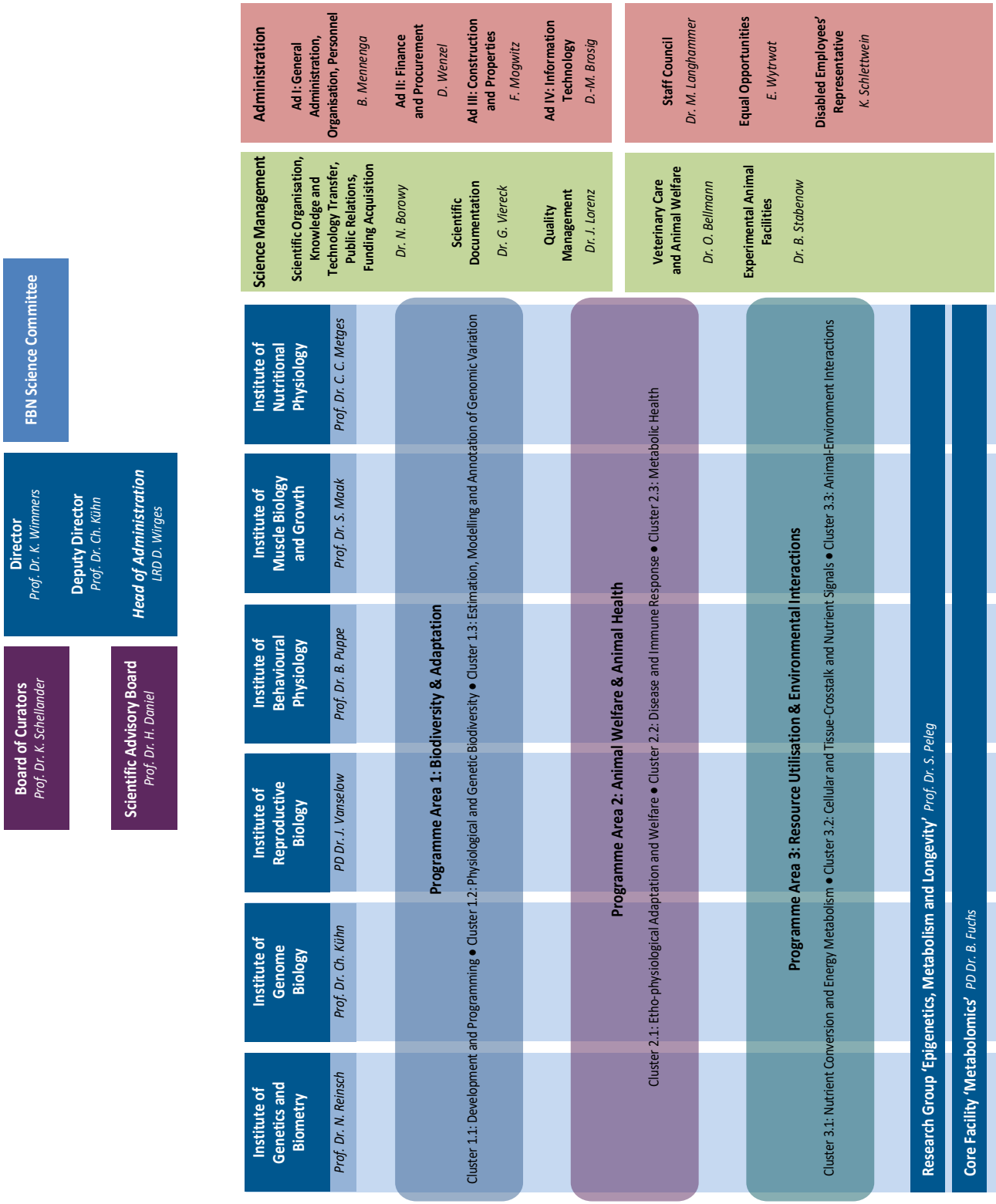
9) The reports of the ***Scientific Advisory Board*** *should include a more detailed assessment of the performance of individual FBN Institutes. In addition, the proportion of women among the members of the Scientific Advisory Board should be increased and more internationally renowned members should be recruited from abroad.*

As a measure of the internationalisation strategy, the FBN and the Board of Curators decided in 2015 to appoint three renowned scientists from abroad to the Scientific Advisory Board (SAB). The SAB now consists of four domestic and four foreign scientists; three female and five male members. The meetings of the Scientific Advisory Board have been held in English since 2016.

The FBN's strategic research concept is implemented through the matrix structure of its discipline-oriented Institutes as the permanent working entities and the interdisciplinary topic oriented Programme Areas. The Institutes pursue their coherent research profile and their commitment to the Programme Areas through the complementary contributions of their Research Units. The SAB monitors the scientific contributions of each Research Unit within the Institutes, and assesses the coherent research profiles and professional excellence of the Institutes.

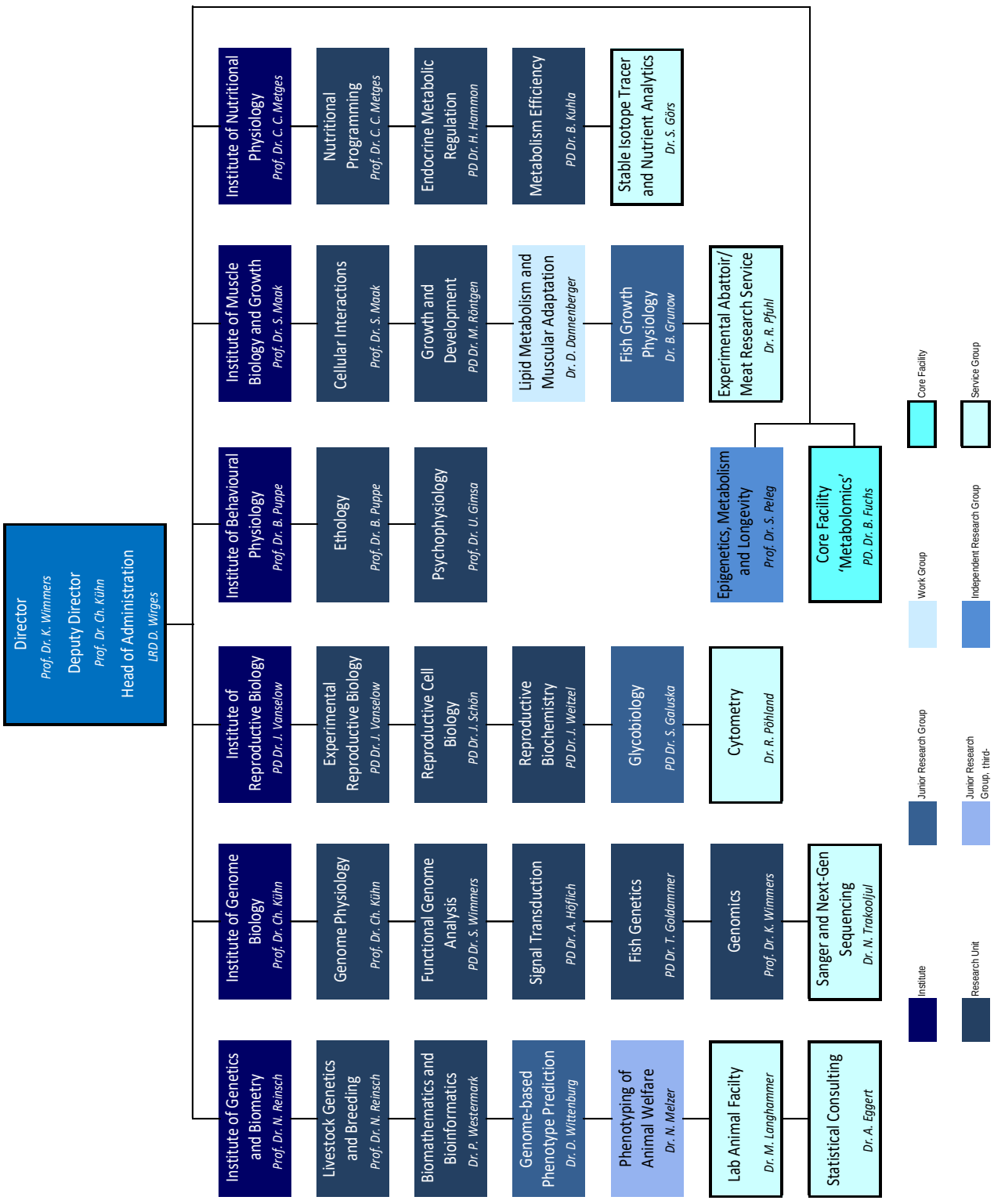
Appendix 1a

Organisational Chart of FBN



Appendix 1b

Organisational Chart of FBN-Institutes



Appendix 2

Publications and patents

Type of publication	2015	2016	2017
Monographs	10	8	8
Individual contributions to edited volumes	20	15	10
Articles in peer-reviewed journals	134	129	133
Articles in other journals	8	7	3
Editorship of edited volumes	1	1	1

Intellectual property rights (2015-2017)	Granted	Registered
Patents	2	8
Other industrial property rights		
Exploitation rights/licences (number)	1	

Appendix 3 Revenue and Expenditure

Revenue		2015			2016			2017 [1]		
		k€	% [2]	% [3]	k€	% [2]	% [3]	k€	% [2]	% [3]
Total revenue (sum of I., II. and III.; excluding DFG fees)		**23443.7**			**23713.4**			**25074.2**		
I.	**Revenue (sum of I.1.; I.2., and I.3.)**	**21193.7**	100 %		**21966.6**	100 %		**23680.9**	100 %	
1.	Institutional Funding (excluding construction projects and acquisition of property)	19108.8	90 %		20283.4	92 %		21430.9	90 %	
1.1	Institutional funding (excluding construction projects and acquisition of property) by Federal and *Länder* governments according to AV-WGL	19108.8			20283.4			21430.9		
1.2	Institutional funding (excluding construction projects and acquisition of property) not received in accordance with AV-WGL	0.0			0.0			0.0		
2.	Revenue from project grants	2082.5	10 %	100 %	1682.5	8 %	100 %	2176.8	10	100 %
2.1	DFG	285.4		14 %	285.9		17 %	529.7		24 %
2.2	Leibniz Association (competitive procedure)	57.9		3 %	32.8		2 %	0.0		0 %
2.3	Federal, *Länder* governments	637.4		31 %	588.4		35 %	607.3		28 %
2.4	EU	481.4		23 %	325.2		19 %	509.2		23 %
2.5	Industry	590.6		28 %	377.1		22 %	393.3		18 %
2.6	Foundations	0.0		0 %	0.0		0 %	65.1		3 %
2.7	other sponsors	29.8		1 %	73.0		4 %	72.2		3 %
3.	Revenue from services	2.4	0 %		0.7	0 %		73.3	0 %	
3.1	Revenue from commissioned work	1.7			0.0			66.9		
3.2	Revenue from publications	0.0			0.0			0.0		
3.3	Revenue from exploitation of intellectual property for which the institution holds industrial property rights (patents, utility models, etc.)	0.7			0.7			0.7		
3.4	Revenue from exploitation of intellectual property without industrial property rights	0.0			0.0			0.0		
3.5	*If applicable: other services*	0.0			0.0			5.6		
II.	**Miscellaneous revenue** (e. g. membership fees, donations, rental income, funds drawn from reserves)	**2150.0**			**1646.8**			**1293.3**		
III.	**Revenue for construction projects** (institutional funding by Federal and *Länder* governments, EU structural funds, etc.)	**100.0**			**100.0**			**100.0**		

Expenditures		k€	k€	k€
Expenditures (excluding DFG fees)		**23443.7**	**23713.4**	**25074.3**
1.	Personnel	14323.7	14129.6	14960.0
2.	Material expenses	4996.9	4958.3	5020.6
2.1	*Proportion of these expenditures used for registering industrial property rights (patents, utility models, etc.)*	*0.0*	*0.0*	*0.0*
3.	Equipment investments	1467.3	631.8	1121.9
4.	Construction projects, acquisition of property	439.5	885.1	518.5
5.	Other operating expenses (reserves)	2216.4	3108.6	3453.4

DFG fees (if paid for the institution - 2.5 % of revenue from institutional funding)	477.2	481.2	487.6

[1] Preliminary data: no

[2] Figures I.1., I.2. und I.3. add up to 100 %. The information requested here is thus the percentage of "Institutional funding (excluding construction projects and acquisition of property)" in relation to "Revenue from project grants" and "Revenue from services".

[3] Figures I.2.1 bis I.2.7 add up to 100 %. The information requested here is thus the percentage of the various sources of "Revenue from project grants".

Appendix 4

Staff

(Basic financing and third-party funding / proportion of women (as of: 31/12/2017)

	Full Time Equivalents		Employees		Female Employees		Foreigners
	total	on third-party funding	total	on temporary contracts	total	on temporary contracts	total
	number	percent	number	percent	number	percent	number
Research and Scientific Services	**89.025**	**27.19**	**116**	**68.97**	**66**	**77.27**	**20**
1st level (scientific director)	1.00	-	1	1	-	-	-
2nd level (institute leaders)	6.00	-	6	50.00	1	-	-
3rd level (unit leaders or equi.)	10.00	-	10	-	5	-	2
Research group / junior research group leaders	5.00	-	5	60.00	2	100.00	-
Regular scientists in non-executive positions (E13, E14 etc.)	31.325	-	36	47.22	20	65.00	5
Additional post-doctoral researchers (E13)	12.50	61.28	15	100.00	8	100.00	3
Doctoral candidates (A13, E13, E13/2 or equi.)	23.20	71.34	43	95.35	30	93.33	10
Service Positions	**107.265**	**0.93**	**121**				
Laboratory (E9 to E12, upper-mid-level service)	33.55	-	37				
Laboratory (E5 to E8, mid-level service)	20.995	-	28				
Veterinary care / experiment (from E 13, senior service)	3.00	-	3				
Animal experiment (E9 to E12, upper-mid-level service)	6.75	14.81	7				
Animal care (E5 to E8, mid-level service)	26.22	-	28				
Technical (large equipment, service) (from E 13, senior service)	2.00	-	2				
Technical (large equipment, service) (E9 to E12, upper-mid-level service)	11.75	-	13				
Technical (large equipment, service) (E5 to E8, mid-level service)	3.00	-	3				
Science Management and Administration	**40.125**	**5.30**	**42**				
Head of the administration	1.00	-	1				
Scientific organisation (from E13, senior service)	3.625	27.59	4				
Scientific documentation (E9 to E12, upper-mid-level service)	1.00	-	1				
Scientific documentation (E5 to E8, mid-level service)	1.00	-	1				
Information technology - IT (from E13, senior service)	1.00	-	1				
Information technology - IT (E9 to E12, upper-mid-level service)	2.00	-	2				
Administration (finances, human resources, facilitiy management etc.) (E9 to E12, upper-mid-level service)	9.375	5.33	10				
Administration (finances, human resources, facilitiy management etc.) (E5 to E8, mid-level service)	14.13	-	15				
Workshops (E9 to E12, upper-mid-level service)	1.00	-	1				
Workshops (E5 to E8, mid-level service)	4.00	-	4				
Facility service, driver (E1 to E4)	2.00	31.25	2				
Student Assistants	**1.99**	**79.15**	**9**				
Trainees	**7.00**	**-**	**7**				
Scholarship Recipients at the Institution	**7.25**	**100.0**	**9**		**4**		**8**
Doctoral candidates	3.25	100.0	5		3		4
Post-doctoral researchers	4.00	100.0	4		1		4

19 September 2019

Annex B: Evaluation Report

Leibniz Institute for Farm Animal Biology, Dummerstorf (FBN)

Contents

Preliminary remarks

A few days before the on-site visit, selected members of the Review Board and the Evaluation Office received an anonymous letter. Allegations were made against the institute that could not be investigated by the Review Board within the framework of the Leibniz Senate's evaluation procedure. Therefore, this letter was forwarded immediately to the Central Ombudsperson of the Leibniz Association who is responsible for investigating cases of presumptive scientific misconduct. The results of possible investigations were then to be considered in the further course of the Leibniz Senate's evaluation procedure.

Meanwhile, the Central Ombudsperson of the Leibniz Association has conducted a formal initial investigation in accordance with § 5 (5) of the "Guidelines on Safeguarding Good Scientific Practice and on Dealing with Allegations of Scientific Misconduct within the Leibniz Association". The Central Ombudsperson came to the conclusion that there is no reason to take further action within the framework of the Leibniz procedures.

1. Summary and main recommendations

The Leibniz Institute for Farm Animal Biology (FBN) is tasked with basic and applied research on the biology of farm animals. Its research results contribute to technological developments and consultancy services for livestock farming, including the major farm animal species and taking into account sustainibility aspects. In FBN's six working units, known as "institutes", researchers trained in biology, agricultural and nutrition sciences, veterinary medicine, engineering, computer sciences and mathematics study the interaction between animal genetics, physiology, behaviour, and the environment. This interdisciplinary work is supported by research facilities, including buildings, experimental setups and animal stocks that even by international standards are excellent.

FBN was last evaluated in 2015. Just as in the 2008 evaluation, it was agreed that the technical developments and consultancy services of FBN are of great importance to the field of agricultural applications. Its research performance, however, was deemed to lag well behind its potential. Then, FBN was expected to be more successful in developing innovative research questions and in achieving excellent research results that would gain more international attention. Against this backdrop, the Leibniz Association Senate decided to evaluate FBN once again in 2019.

When the previous Director of FBN retired in 2015, the long-term head of the Institute of Genome Biology became the new Director as part of a joint appointment with the University of Rostock in 2016. He had already headed FBN during the vacancy. Under the new Director, FBN concentrated on implementing recommendations on individual aspects issued at the last evaluation. In order to enhance the coherency of activities within the six institutes and improve cooperation between them, the number of programme areas addressed jointly by the institutes has been reduced from four to three whilst each programme area was divided into three clusters. Moreover, the strategies for performance-related funding, publications and the acquisition of third-party funding have been reworked. Some of the leadership positions in newly established groups have been filled by researchers from outside of FBN and the Scientific Advisory Board (SAB) has been made more international. In addition, FBN's research infrastructure has been made available to external scientific users as had been recommended in the previous two evaluations. However, the various measures described above have not been completely effective. FBN's six institutes are now rated as "very good" in two cases, "good to very good" in a further two cases and "good" in the remaining two. This is precisely the same spectrum of ratings as it was at the last evaluation. The Institute's great potential for addressing important research questions leading to innovative results with international impact is still not being fully exploited.

Special consideration should be given to the following main recommendations in the evaluation report (highlighted in **bold face** in the text):

<u>General concept and profile (Chapter 2)</u>

1. FBN must still improve its research performance, especially in its weaker rated institutes. In the context of a **comprehensive overarching strategy**, the joint work of the six institutes must be more clearly focussed on interdisciplinary and innovative

questions that will enable all of them to produce research results that attract more international recognition.

2. In accordance with previous recommendations, FBN has revised its **publication strategy**. The number of publications has remained on a similar level compared to the last evaluation although FBN managed to publish more frequently in higher-ranking journals. Overall, however, the Institute still must improve its publication performance, by further increasing the impact and the number of publications.
3. **Third-party income** varies between the six institutes but is still low from an overall perspective (approx. 10% of the overall budget). Already at the last evaluation it was considered to be too low (€6.4 m between 2011-2013) and since then, it has even decreased (€5.9 m between 2015-2017). Income from the DFG, in particular, declined such that in some years it did not balance with the obligatory DFG fees. It is commendable that in 2017 and 2018 a total funding of €3.6 m and €4.5 m, respectively, was approved for new FBN projects. From 2019 onwards, the Institute must now regularly acquire funding at this level in order to achieve its own mid-term goal of raising 20 percent of its entire annual budget from third-party funding. In the long term, as planned, FBN should achieve a quota of at least 25 percent.
4. FBN envisages **expanding its research infrastructure** yet further with additional institutional funding amounting to €3.45 m in 2020 (temporary extraordinary item of expenditure). The Institute wants to acquire a magnetic resonance imaging (MRI) scanner (€3.3 m) to be operated by a new research group "Live Imaging" (€150 k for the salary of scientific seed personnel in 2020). It is, however, not sufficiently clear for which new scientific purposes the equipment would serve. Therefore, FBN's plans are not endorsed. For the time being, FBN should focus on better exploiting its existing excellent research infrastructure.

<u>Staff development and promotion of junior researchers (Chapter 5)</u>

5. Already since 2009, it has been possible to appoint five, and subsequently all six, heads of institutes to joint professorships with the University of Rostock. It is therefore disappointing that the three vacancies that occurred in the last ten years were not advertised as **joint appointments** by FBN. Instead, the heads of institutes were hired without joint appointments (in all three cases, FBN scientists were promoted). It is expected that this will be handled differently in future. FBN has to advertise these positions as joint appointments and capitalise on these opportunities for attracting the best scientists.
6. FBN has supervised many interesting doctoral projects in recent years. Since the last evaluation, however, the **number of completed doctorates** has dropped. Between 2011 and 2013, 41 doctorates were completed in comparison with only 27 in the period 2015 to 2017. FBN must increase the number of doctorates completed.
7. Doctoral candidates are supervised according to the "Guidelines for Doctoral Studies at the FBN". Students can participate in various courses at FBN and the Graduate Academy of Rostock University. In addition, FBN still should develop and implement its **own structured graduate programme**, as already recommended at the last

evaluation. The programme should be mandatory for all doctoral candidates of the six institutes and include advanced training in key transdisciplinary areas of farm animal biology. The structure of the programme could be similar to the Graduate School of the Leibniz ScienceCampus "Phosphorus Research Rostock", in which FBN participates with a few doctoral candidates. Furthermore, it is recommended to introduce thesis committees.

Quality management (Chapter 6)

8. The **Board of Curators** is composed of four representatives of the *Land* Mecklenburg-Vorpommern and the federal state, the Chairperson of the Scientific Advisory Board (SAB) and two additional researchers. The SAB Chairperson should be a non-voting member in line with standard practice at Leibniz institutions.

   The Chairperson of the Board of Curators is elected from the members of the board. Currently, this is one of the two scientific members who was previously the long-term Chairperson of the SAB. He is head of the department at the University of Bonn in which FBN's Director completed his habilitation. They have also co-authored a number of publications. In order to ensure the independence of the Board of Curators, it is expected that the Chair of the Board of Curators is refilled and that conflicts of interest are avoided in the future.

9. Attention is drawn to the recommendation issued by the Leibniz Senate to locate responsibility for FBN in the **Mecklenburg-Vorpommern Science Department**, which is already responsible for all other Leibniz institutes in the *Land,* and which can ensure appropriate scientific supervision.

2. General concept and profile

Development of the institution since the last evaluation and strategic work planning for the next few years

FBN was last evaluated in 2015. Just as in the 2008 evaluation, it was agreed that the technical developments and consultancy services of FBN are of great importance to the field of agricultural applications. Its research performance, however, was deemed to lag well behind its potential. Then, FBN was expected to be more successful in developing innovative research questions and in achieving excellent research results that would gain more international attention. This in turn would also enable FBN to better exploit its potential to acquire third-party funded research projects and to improve its publication record, both in terms of quality and quantity. Against this backdrop, the Leibniz Association Senate decided to evaluate FBN once again in 2019.

When the previous Director of FBN retired in 2015, the long-term head of the Institute of Genome Biology became the new Director as part of a joint appointment with the University of Rostock in 2016. He had already headed FBN during the vacancy. Under the new Director, FBN concentrated on implementing recommendations on individual aspects issued at the last evaluation. In order to enhance the coherency of activities within the six institutes and improve cooperation between them, activities were re-structured.

Under the heading "Research for better Livestock Farming", the institutes now cooperate in three, instead of previously four, new programme areas: "Biodiversity and Adaption", "Animal Welfare and Health" and "Resource Utilisation and Environmental Interactions". Each programme area is, moreover, divided into three clusters. In addition, the strategies for performance-related funding, publications and the acquisition of third-party funding have been revised. Some of the leadership positions in newly established groups have been filled by researchers from outside of FBN, and the Scientific Advisory Board (SAB) has been made more international. Furthermore, FBN's research infrastructure has been made available to external scientific users, as had been recommended at the previous two evaluations.However, the various measures described above have not been completely effective. FBN's six institutes are now rated as "very good" in two cases, "good to very good" in a further two cases and "good" in the remaining two (see Chapter 3). This is precisely the same spectrum of ratings as it was at the last evaluation. The Institute's great potential for addressing important research questions leading to innovative results with international impact is still not being fully exploited.

FBN must still improve its research performance, especially in its weaker rated institutes. In the context of a comprehensive overarching strategy, the joint work of the six institutes must be more clearly focussed on interdisciplinary and innovative questions that will enable all of them to produce research results that attract more international recognition.

Results

Research

In accordance with previous recommendations, FBN has revised its publication strategy. The revised publication concept includes additional motivation to publish in journals with Impact Factor >5 by awarding extra research funds to first, senior and corresponding authors. **The number of publications has remained on a similar level compared to the last evaluation although FBN managed to publish more frequently in higher-ranking journals. Overall, however, the Institute still must improve its publication performance, by further increasing the impact and the number of publications.**

Since 1993, FBN has published the international scientific journal "Archives Animal Breeding" (Impact Factor 2017: 1.2). Given the amount of resources assigned to this activity, FBN should consider whether there is still sufficient demand for the journal in the international scientific community.

Scientific services and infrastructure tasks

Already at the 2008 evaluation, FBN was recommended to make its exceptional infrastructure more accessible to external researchers in terms of a scientific service. To do so, the Board of Curators considered it necessary to amend FBN's statutes but decided against any such change. In response to the recommendation being reiterated at the last evaluation, the statutes were indeed amended in 2017. This immediately meant that FBN was able to participate in a major European infrastructure project (*SmartCow*), which is

highly welcomed. *SmartCow* integrates European cattle research infrastructures from 11 institutes in 7 countries to promote their coordinated use and development. A similar project involving pigs is currently in the pipeline.

It is welcomed that FBN has established an administrative framework to provide infrastructure and services. It includes guidelines for access, contract solutions, service fees, and warrantees. In this context, FBN coordinated the project "Model for cross-institutional services for knowledge and technology transfer in regional networks" which was funded by the Federal Ministry of Education and Research and included all five Leibniz Institutes in Mecklenburg-Vorpommern. In addition, a Knowledge and Technology Transfer (KTT) service unit has been established, which provides information on research infrastructures, as well as on technology and knowledge transfer (see below).

Technology and knowledge transfer in the field of applications

FBN conducts important technology and knowledge transfer activities for users involved in farm animal husbandry. Innovative applications, such as early identification of lameness, have, for example, been developed and successfully implemented in the field. Between 2015 and 2017, eight patents were registered and two were granted. FBN currently holds four patents, two of which are licensed out. In addition, FBN researchers are active in various working groups and on councils and committees advising businesses, associations and other institutions.

Scientific consultancy for political decision-makers

Staff at FBN are involved in various advisory bodies for political decision-makers. FBN's advisory services are of particular importance to the relevant departments, the Federal Ministry of Food and Agriculture (BMEL) and the Ministry of Agriculture and Environment in Mecklenburg-Vorpommern, the federal state in which the Institute is located. Based on its research results, FBN provides advisory services on areas that are not covered by federal and *Länder* departmental research institutions. Research conducted by Departmental Federal Research Institutes and the six Leibniz Institutes assigned to the BMEL is coordinated by BMEL's Research Steering Committee.

Appropriateness of facilities, equipment and staffing

Funding

The level of institutional funding is sufficient to enable FBN to fulfil its current portfolio. In 2017, institutional funding totalled approx. €23.7 m.

Third-party income varies between the six institutes but is still low from an overall perspective (approx. 10% of the overall budget). Already at the last evaluation it was considered to be too low (€6.4 m between 2011-2013) and since then, it has even decreased (€5.9 m between 2015-2017). Income from the DFG, in particular, declined such that in some years it did not balance with the obligatory DFG fees. It is commendable that in 2017 and 2018 a total funding of €3.6 m and €4.5 m, respectively, was approved for new FBN projects. From 2019 onwards, the Institute must now regularly acquire funding at this level in order to achieve its own mid-

term goal of raising 20 percent of its entire annual budget from third-party funding. In the long term, as planned, FBN should achieve a quota of at least 25 percent. It is welcomed that FBN employs a scientific officer supporting the acquisition of extramural funds at the institute.

In order to finance building work (particularly for the new experimental pig facilities), FBN has set aside funds which will be disbursed in the coming years (see Status Report, Appendix 3, line II.).

Buildings and animal facilities

FBN has outstanding buildings and experimental animal facilities. Since FBN was established in 1993, the buildings have been renovated or replaced at a total investment of approximately €50 m. The buildings and facilities comprise the Animal Technical Centre (2003), the Model Animal Laboratory (2011), the Experimental Facilities for cattle (2012), pigs (1998), poultry (2015), goats (2014) and aquaculture (2017) as well as installations for keeping insects for feed and food (2018) and the EU-approved abattoir (2003). At present, the Experimental Facilities for pigs are being expanded with a "project barn" for 362 pigs.

Scientific instrumentation and IT

FBN has a number of excellent and, in some cases, unique large-scale special laboratories. They include laboratories for whole-body energy measurements of large farm animals in respiratory chambers, for quantitative bioacoustic measurements; for genome, transcriptome, proteome and metabolome analyses; for cell and tissue culture; for stable and radioactive isotopes as well as special laboratories for video evaluation, and quantitative histological and cytometric measurements. In addition, demanding surgical procedures can be performed in the veterinary laboratory.

FBN envisages expanding its research infrastructure even further with additional institutional funding amounting to €3.45 m in 2020 (temporary extraordinary item of expenditure). The Institute wants to acquire a magnetic resonance imaging (MRI) scanner (€3.3 m) to be operated by a new research group "Live Imaging" (€150 k for the salary of scientific seed personnel in 2020). It is, however, not sufficiently clear for which new scientific purposes the equipment wouldd serve. Therefore, FBN's plans are not endorsed. For the time being, FBN should focus on better exploiting its existing excellent research infrastructure.

All facilities, including the experimental animal facilities, are integrated into an IT infrastructure, which provides a basis for research data management in accordance with FBN's Research Data Policy (see Chapter 6: Quality Management).

3. Subdivisions of FBN

3.1. Institute of Genetics and Biometry

(6.7 FTE in research and scientific services, 2.0 FTE postdoctoral researchers on grants or fellowships, 4.45 FTE doctoral candidates, 13.85 FTE services as of 31.12.2017)

The institute's objective is to investigate the inheritance of agriculturally important traits in farm animals. Using methods derived from mathematics and bioinformatics it studies the genetic basis of traits that are of relevance to breeding practice. The institute comprises two research units that are both supported by a junior research group, respectively. Two service groups are also assigned to the institute. The head of the institute has held this position at FBN since 2002 and has also been an adjunct professor at the University of Kiel since 2006.

The Research Unit Bioinformatics and Biomathematics develops statistical and mathematical models as well as the relevant analytical software. These are used on the one hand to continue studying the links between genotypes and phenotypes for traits that are important in farm animals. On the other, for the last three years, innovative chronobiological studies of the "inner clock" of animals have also been conducted. This topic, which is new to FBN, relies on the expertise of the head who, until 2016, conducted work in this field at Charité, some of which was published in high level journals. He joined FBN when his predecessor transferred to a different position after three years.

Biostatistical activities were extended in 2013 with the establishment of a Junior Research Group Genome-based Phenotype Prediction. On the strength of an external evaluation, the group recently became the permanent Research Unit Statistics in Genomics. This is a plausible development in view of the success of the work which has also been funded by two DFG individual research grants since 2016 and 2017 respectively. The objective of this unit is to improve the genomic statistical analysis of quantitative traits in farm animals.

Based on the work in bioinformatics the Research Unit Livestock Genetics and Breeding continues since a long time its very successful studies of genomic imprinting in inheritance. Amongst others, a DFG project was acquired in this thematic field. The results are applied to cattle and pig breeding. The unit also conducts convincing research on quantitative trait locus detection which is relevant to understand the genetic basis of traits and for assessing animals' breeding values. This unit is led by the head of the institute who is expected to retire in 2022.

The activities of the Research Unit are reinforced by the Junior Research Group Phenotyping of Animal Welfare which is funded (2013-2019) by the BMBF network "Phenomics". In collaboration with the Institute of Behavioural Physiology, the group successfully develops methods for uncovering patterns of interactions between animals.

The Service Group Statistical Consulting provides important advisory services for all groups at FBN on planning experiments, modelling, analysing data, and interpreting statistical results. Therefore, staff in this group are involved in many publications. The long-standing, successful leader of this group retired in 2018 and the position has been filled very well. It is important to achieve the same success in filling the second senior scientist position which will also shortly be due for re-appointment.

The Service Group Lab Animal Facility is responsible for the care of 6,000 mice. The mouse lines have been selectively bred since the 1970s for traits that are relevant to farm animals (e.g. high fertility, growth and endurance) and are thus unique. They offer great potential which should be exploited yet better by both in-house research at FBN and by external users.

Overall, the performance of the Institute of Genetics and Biometry has remained at the same level as at the last evaluation and is therefore rated again as "good to very good". The statistical activities are an important service for FBN as a whole. Between 2015 and 2017, however, less peer reviewed papers were published than between 2011 and 2013, with publications in higher ranking journals were a bit more frequent. Third-party income fell. It is, however, positive that, since 2016, three projects have been started that are funded by the DFG. This trend should be reinforced, and EU funding should also be sourced. Qualitatively, the institute's work has been strengthened by the two new heads of Research Units whose work holds great potential.

3.2. Institute of Genome Biology

(12 FTE in research and scientific services, 6 postdoctoral researchers on grants or fellowships, 5.55 FTE doctoral candidates, 18.54 FTE services as of 31.12.2017)

FBN's largest institute deals with the identification of the genetic and epigenetic basis of heredity and differentiation of traits relevant to breeding. In five Research Units and one Service Group successful research is conducted in the fields of disease resistance and immune response, nutrient utilisation as well as metabolic and environmental adaptation. The current head of the institute took over the position from FBN's current Director in 2018. She has been working at FBN since 1992, became Deputy Director in 2012 and a W2 professor at the University of Rostock (joint appointment with FBN) in 2014.

The Research Unit Genome Physiology, led by the head of the institute, investigates the causal chain from genotypic to phenotypic diversity with a special eye to ruminants and horses. One focus of its convincing work addresses issues relating to animal health, resilience, resource efficiency and product quality. From 2019 to 2023, the Research Unit is coordinating the EU project *BovReg* that aims to deliver a comprehensive catalogue of functionally active elements in the bovine genome. Twenty partners are involved in the project with funding of six million euro. The data will flow into the international FAANG Consortium (Functional Annotation of Animal Genomes). Currently, a repository with tissue samples is being created. FBN's long-term goal is to develop a biobank to complement existing gene banks. FBN is aware that implementing such an ambitious plan will mean it has to expand its own expertise in the field.

The Research Unit Genomics, headed by FBN's Director, successfully investigates the interaction of genes in expressing complex traits in pigs and chickens. Studies are undertaken at the genome, epigenome and transcriptome levels. The range of methods is both state of the art and appropriate.

The three other Research Units in the institute also produce convincing results. The Research Unit Functional Genome Analysis successfully examines the different genetic and

epigenetic-physiological foundations for the important breeding traits farm animals have developed in the course of domestication.

The Research Unit Fish Genetics studies the genetic causes of differences in adaptation capacity in fish, facilitating the development of novel robust breeding lines that maintain fish welfare, while optimising fish production.

The Research Unit Signal Transduction investigates the effects of individual genes on intracellular signal cascades, using both mouse models and FBN's livestock species. The Research Unit contributes to better understanding growth, muscle mass, and energy metabolism in farm animals.

In order to bundle the sequencing services that had already been provided over a long period, in 2018, the Service Group Sanger and NextGeneration Sequencing was established under the leadership of a researcher from the Research Unit Genomics. It provides important services for internal and external partners in the field of functional genome analysis.

All in all, the performance of the Institute of Genome Biology equates with the situation at the last evaluation and is therefore, once again, rated as "very good". At the last evaluation it was rated as the top performing institute at FBN and some activities were thought to have the potential to produce very high-ranking results, which could generate publications in the top journals. Since then, the publication record has improved, both in terms of quantity and quality. This trend should be perpetuated. Third-party incomehas dropped, but is still at a high level and continues to involve EU and DFG funding (including two part-projects in a DFG Research Group coordinated by the University of Hohenheim). In its future development the institute should continue to monitor the coherence of its research programme, particularly with regard to the range of animal species studied.

3.3. Institute of Reproductive Biology

(9.0 FTE in research and scientific services, 3.5 postdoctoral researchers on grants or fellowships, 3.45 FTE doctoral candidates, 14.88 FTE services as of 31.12.2017)

The institute investigates the underlying processes of reproduction at the clinical, physiological and molecular level, considering genetic variation and different environmental conditions. It comprises three Research Units, a Junior Research Group and a Service Group. Efforts seek to define reproductive phenotypes and develop new biomarkers for breeding healthy, fertile animals. The head of the institute has held this position since 2013, having joined FBN in 1992. Since 2002, he has been private lecturer (*Privatdozent*) at the University of Rostock.

The Research Unit Experimental Reproductive Biology, led by the head of this institute, conducts research into the reproductive potential of cows and sows, taking into account genetic variation and differing environmental conditions. The unit pays particular attention to the mechanisms of female cycle control as well as factors that influence embryonic development, implantation and pregnancy. It benefits from cooperation with two experimental veterinarians with clinical expertise which enable it to perform experiments on large animals such as cattle and pigs.

Under its new head, who joined FBN in 2014, the Research Unit Reproductive Cell Biology has been re-framed. Research now focusses on developing innovative cell culture models for investigating interaction between the embryo and the maternal organism. Based on these models, some remarkable research results have been achieved. Moreover, the group is also involved in the convincing work being conducted on FBN's fertility mouse lines by the Research Unit Reproductive Biochemistry (see below). Since 2018, the DFG and the *Agence Nationale de la Recherche* (ANR) have funded a project being conducted by the head and a French colleague to elucidate the interaction between sperm and fallopian tube, and its importance for artificially inseminating dairy cows. Another project was also recently approved in the Leibniz Competition.

The Research Unit Reproductive Biochemistry studies the molecular mechanisms of germ cell development. The foundations for this interesting work are provided by FBN's high fertility mouse lines. The DFG has been funding a project on this topic since 2018. The group also investigates the connections between the concentration of oxidatively modified lipids and the fertility of high-performance dairy cows, also funded by the DFG.

Organisationally associated with the Research Unit is the Junior Research Group Glycobiology which was established in 2016. The unit studies the role of glycans in male and female reproductive tracts. The techniques used have great potential for generating a broad range of topics also in other FBN institutes. Against this backdrop, it could be advantageous to make this group a core facility for all six institutes (see 3.7.).

The Service Group Cytometry provides extensive methods, such as flow cytometric methods, microscopy, image analysis and live cell imaging, for internal and external partners. The group can provide for a high level of expertise and is also involved in international networks via the German Society for Cytometry.

Overall, the Institute of Reproductive Biology is rated as "good". At the last evaluation it was noted that the institute, which was rated as "good to very good" was going through a consolidation process. It was recommended to develop and implement a strategy for the institute in order to relate the individual activities, which in themselves were interesting, more closely with one another. This recommendation is still valid. Cross-cutting, innovative research questions must be developed for the Institute of Reproductive Biology. Four years ago, a recommendation was also issued to improve the publication record and third-party income. Since then, however, the number of publications has dropped. Publications have appeared in higher-ranking journals, but this should be achieved more regularly. Third-party income has increased and includes DFG funding. This trend should be perpetuated.

3.4. Institute of Behavioural Physiology

(8.0 FTE in research and scientific services, 2.0 postdoctoral researchers on grants or fellowships, 4.15 FTE doctoral candidates, 9.93 FTE services as of 31.12.2017)

The institute studies biological principles of farm animal behaviour with the aim of characterising the physical and psychological well-being of farm animals. The institute comprises two Research Units which cooperate successfully within a coherent, effectively coordinated research programme. The head of the institute has held the post since 2014.

Since 2009, he has headed the Research Unit "Ethology" and has been employed at FBN since 1989. In 2012, he also became a W2 professor at the University of Rostock (joint appointment with FBN).

In the head's Research Unit Ethology, relevant theoretical and experimental methods of behavioural biology are employed to investigate the physical and mental adaptability of farm animals. On the basis of its research results, innovative procedures are developed for industrial applications in terms of precision livestock farming which have generated several patents. Special mention should be given, e. g., to developments on early lameness detection in cattle and signal feeding of pigs.

The Research Unit Psychophysiology successfully studies adaptation processes in farm animals on the neuroendocrine and immunology levels related to mental and physical stressors. These activities address, for example, the effects of psychosocial stress on pigs caused by husbandry conditions.

All in all, the Institute of Behavioural Physiology continues to be rated as four years ago as "very good". The working programme achieves a very good balance between fundamental research and practice-related development activities. As recommended, cooperation with other institutes at FBN has been intensified and it also maintains good collaborations with international partners. Its publication record is very good. Third-party income is high and includes DFG and EU funding. The institute has continued to develop positively since the last evaluation and is now rated as one of the top performing institutes of FBN.

3.5. Institute of Muscle Biology and Growth

(7.63 FTE in research and scientific services, 1.8 FTE doctoral candidates, 13 FTE services as of 31.12.2017)

The institute investigates the mechanisms of growth in muscle, adipose and connective tissue as well as the interactions between these types of tissue. Insights in this field play an important role for the sustainable and efficient production of meat for human consumption as well as for maintaining animal health. The institute comprises two Research Units, a Work Group, a Junior Research Group and a Service Group. The head of the institute has held this position at FBN since 2007. Since 2011, he has also been an adjunct professor at the University of Halle-Wittenberg.

In the head's Research Unit Cellular Interactions, the interaction between muscle fibres and fat cells is studied. Research focusses on identifying myokines and adipokines and understanding their role in regulatory cascades of myogenic and adipogenic differentiation. These activities help to improve the understanding of processes leading to high quality meat with healthy animals.

The Research Unit Growth and Development investigates myogenesis as the foundation of skeletal muscle plasticity. Interesting work is conducted on the early postnatal extension of myofibre formation in pigs.

In 2018, two new groups were established and are still under construction. The Work Group Lipid Metabolism and Muscular Adaptation was set up after the head of the Junior

Reseach Group Cellular Lipid Metabolism left FBN. She was also acting head of the Research Unit Function of Bioactive Lipids which then came to an end, as well.

By establishing the new Junior Research Group Fish Growth Physiology the institute expanded its horizon to embrace the area of aquaculture. The group has great potential, not least with regard to joint activities with the Research Unit Fish Genetics in the Institute of Genome Biology.

The Service Group Experimental Abattoir and Meat Research Service uses state-of-the-art methods to analyse meat quality and body composition of farm animals. It also provides standardised sampling for a variety of scientific topics both for internal and external users. The affiliated meat quality laboratories are equipped with the most recent analytical methods.

Overall, the performance of the Institute of Muscle Biology and Growth has maintained the same level as at the last evaluation and is thus rated, once again, as "good". Four years ago, it was pointed out that the institute should develop a greater number of innovative topics in order to gain more visibility in the scientific environment. This point is still valid. The number of publications dropped in comparison with the last evaluation although the institute published rather more frequently in higher-ranked journals. Third-party income has been increased, especially funding from industry. The institute has still not, however, succeeded in raising funds from the DFG or at EU level.

3.6. Institute of Nutritional Physiology Oskar Kellner

(9.0 FTE in research and scientific services, 1.0 postdoctoral researcher on fellowship, 4.9 FTE doctoral candidates, 15.95 FTE services as of 31.12.2017)

The institute addresses the identification of regulatory mechanisms for nutrient conversion in the metabolism of farm animals in order to contribute to sustainable, animal-friendly nutrition. Its two main areas of work focus on the effects of pre- and early postnatal nutrition on metabolism, development and health, and metabolic resilience and efficiency under different environmental and feeding conditions. The institute comprises three well-coordinated Research Units and a Service Group. The head of the institute joined FBN in this role in 2001. In 2017, she also became an adjunct professor at the University of Rostock.

The head's own Research Unit Nutritional Programming produces very good results on the effects of early maternal nutrition on growth and development, changes in the energy and macronutrient metabolism, and intestinal functionality of the descendants in pigs and poultry.

The other two Research Units also produced convincing results. The Research Unit Endocrine Metabolic Regulation studies the impact of nutrients and bioactive substances on metabolism, health and immune system of calves as well as on metabolic stability in dairy cows.

The Research Unit Metabolism Efficiency investigates neuroendocrine, metabolic and cellular signalling pathways for the regulation of feed intake in the dairy cow. Research

findings help to promote the efficient conversion of plant-based feed into animal products against the backdrop of increasingly scarce resources and global warming.

The Service Group Stable Isotope Tracer and Nutrient Analytics, which was established in 2018, amalgamates the various methods and techniques available at FBN forqualitative and quantitative analyses of metabolites and nutrients, either labelled with stable-isotopes or unenriched, in biological fluids. They are used by internal and external partners for functional phenotyping of nutrition-related metabolic processes.

All in all, the Institute of Nutritional Physiology is rated as "good to very good". Its performance has improved in comparison with the last evaluation when the institute was rated as "good". The number of publications has remained roughly stable, whereas the quality has improved. The institute closely cooperates with other FBN institutes. Third-party income has increased and has now reached a high level. A highlight is the project *SmartCow* (see Chapter 2) which has been funded by the EU since 2018. The institute should continue this positive trend with funding from the EU as well as the DFG. The respiration chambers, in particular, offer great potential for further innovative projects and thus for enhancing the institute's performance even further.

3.7. Units directly reporting to the director

In 2018, two independent groups were established which are currently under development. Two external researchers have been recruited to head the groups.

The Independent Research Group Epigenetics, Metabolism and Longevity investigates metabolic and epigenetic changes that help to explain age-related cognitive impairment. For this purpose, it combines behavioral experiments in mice and flies with advanced mass spectrometry and biochemical methods.

The Metabolomics Platform pools and develops services for the FBN institutes, and offers analysing, characterising and quantifying metabolites in organisms. It is welcomed that these services are also available to external users.

4. Collaboration and networking

Collaboration with the University of Rostock

FBN cooperates closely with the University of Rostock. The collaborative agreement includes the joint appointment of the FBN Director to a W3 professorship. Moreover, since 2009, it has been possible to appoint five, and subsequently all six, heads of institutes to joint professorships at the University of Rostock. To date, this option has been used for the position of Director and two heads of institutes (see Chapter 5).

It is welcomed that, together with five Faculties at the University of Rostock, FBN is involved in the Leibniz ScienceCampus "Phosphorus Research Rostock" that is coordinated by the Leibniz Institute for Baltic Sea Research (IOW). The ScienceCampus also includes the Leibniz Institutes for Catalysis (LIKAT), Plant Genomics and Crop Plant Research (IPK) as well as Plasma Research and Technology (INP). In this context, a joint graduate school was established in 2015 (see Chapter 5).

FBN is strongly involved in teaching at the University of Rostock. Special mention should be made of the jointly organised interdisciplinary Master's programme "Animal Sciences" that was re-accredited in 2018.

Collaboration with other universities

It is welcomed that FBN recently signed a collaborative agreement with the University of Greifswald, which includes the possibility of joint appointments. FBN also maintains a partnership with the University of Kiel based on a joint agreement going back to 2007. Joint activities are also pursued with, amongst others, the universities of Halle-Wittenberg, Hohenheim, Bonn, Giessen, Leipzig, Veterinary Medicine Hanover and FU Berlin. FBN is involved in teaching at these universities, as well. In total, 35 members of FBN's staff teach at nine universities and held more than 700 semester hours of courses between winter semester 2014 and winter semester 2018.

Collaboration with other domestic institutions

Within the Leibniz Association, FBN cooperates in particular with the institutes involved in the Leibniz ScienceCampus "Phosphorus Research Rostock" (see above). It is also part of the three Leibniz Research Alliances "Biodiversity", "Healthy Ageing" und "Sustainable Food Production and Healthy Nutrition" as well as the Leibniz Network "Mathematical Modeling and Simulation". FBN closely coordinates its activities with the BMEL's Departmental Federal Research Institutes and the five other Leibniz Institutes for which the BMEL is responsible. Coordination is conducted by the BMEL's Research Steering Committee.

Collaboration with international institutions

FBN and the Leibniz Institute for Agricultural Engineering and Bioeconomy (ATB, Potsdam) established a relationship with the Institut National de la Recherche Agronomique (INRA) in France, which has generated reciprocal working visits. FBN receives funding, moreover, from European structural and investment funds (European Maritime and Fisheries Fund, European Regional Development Fund and European Social Fund). Special mention should be made of the funding from the European programme *Horizon 2020*: FBN coordinates the collaborative project *BovReg* (see Chapter 3.2), with 20 European partners, and is involved in the project *SmartCow* (see Chapter 3.6), coordinated by INRA. In addition, FBN is coordinating a European Research Area Network from 2017 to 2020, as well as being involved in a further ERA Network.

5. Staff development and promotion of junior researchers

Staff development and personnel structure

FBN's personnel structure is appropriate to its portfolio. On 31 December 2017, FBN employed 279 persons (excluding student assistants, trainees and scholarship recipients, see Status Report Annex 4). 116 persons worked in research and scientific services (including 43 doctoral candidates), 121 in services (e.g. laboratory or animal care), and 42 were employed in science management and administrative tasks.

Promotion of gender equality

At 57 percent, the overall share of women in research and scientific services is pleasingly high (66 out of 116 individuals as of 31 December 2017). At leadership levels women are, however, underrepresented. Since 2018, only two of the seven top leadership positions (Director and six heads of institutes) have been filled with women (29%). At the level immediately below, seven of the 15 group leaders are women (47%). It is welcomed that in accordance with the binding regulations issued by the Federal and *Länder* governments, FBN has introduced target quotas in order to increase the proportion of women in positions of responsibility.

FBN has implemented various measures to combine work with family life. In 2014 and again in 2017, FBN was awarded the certificate "berufundfamilie Service GmbH".

Appointment of the Director

At the time of the last evaluation, the position of Director was due to be refilled, following the retirement of FBN's previous Director in 2015. In its statement of November 2015, the Leibniz Association Senate had pointed out that the previous Director's expansion of FBN's outstanding infrastructure had paved the way for the future development of the Institute. On this basis, it would be the foremost responsibility of the new Director to drive FBN's scientific performance. In order to be able to specifically implement the changes this would necessitate, FBN was encouraged to employ a personality with extensive experience at internationally renowned research institutions.

The current Director was appointed in 2016. He acted as interim Director during the vacancy and had been head of FBN's Institute of Genome Biology since 2004. As of 2008, he also became an adjunct professor at the University of Bonn where he had completed his habilitation six years ago. He was succeeded in the Institute of Genome Biology by the Deputy Director who had been working at FBN since 1991.

Appointment of heads of institutes

Already since 2009, it has been possible to appoint five, and subsequently all six, heads of institutes to joint professorships with the University of Rostock. It is therefore disappointing that the three vacancies that occurred in the last ten years were not advertised by FBN as joint appointments. Instead, the heads of institutes were appointed without joint appointments (in all three cases, FBN scientists were promoted). It is expected that this will be handled differently in future. FBN has to advertise these positions as joint appointments and capitalise on these opportunities for attracting the best scientists. Whilst two of the six heads of institutes do currently hold joint W2 professorships at the University of Rostock, the appointments were made independently of their appointments as heads of institutes at FBN. This is also true of the three leadership positions that are linked to the universities of Rostock, Halle and Kiel by adjunct professorships. The head of the sixth institute is a researcher with professorial qualifications.

The positions of FBN-Director and heads of institutes are for five years but can be extended repeatedly. This is standard procedure at Leibniz Institutes. It is, however, not

appropriate that the regulations on appointing the Director are contained in the rules of procedure (*Geschäftsordnung*) issued by the Director him or herself. Furthermore, according to the rules of procedure, if one of the six positions as head of institute is not extended but remains at the institute, a successor will be chosen from the Institute's pool of core-funded senior scientists. As stated in the 2015 evaluation, this is not an appropriate scientific procedure. The regulations on appointing the Director and heads of institutes should be brought into line with the standard regulations at Leibniz institutions and not enshrined in the rules of procedure issued by the Director but rather in FBN's statutes (*Satzung*).

Appointment of other senior scientists

It is welcomed that FBN has introduced a procedure for establishing Junior Research Groups in combination with transparent tenure-track regulations. The tenure-track guidelines contain professional, performance-related, and personal requirements. Completion of the tenure-track term is evaluated by members of the Scientific Advisory Board and external reviewers. Of the five Junior Research Groups at the time of the last evaluation, four have since been completed. One group leader left FBN at an earlier stage, the other three were given tenured positions. Of these three, two have become tenured scientific associates in existing Research Units. In the third case, the Junior Research Group was transformed into a new Research Unit. In addition to the still ongoing Junior Research Group, since the last evaluation, two further Junior Research Groups have been established. In accordance with recommendations, the leadership positions were given to external candidates.

Individuals who do not head groups are also eligible for the tenure-track procedure. In the period 2015-2018, a total of 13 tenure-track positions were filled (including the two new Junior Research Groups). Of these, seven positions went to external candidates.

Promotion of junior researchers

FBN has supervised many interesting doctoral projects in recent years. Since the last evaluation, however, the number of completed doctorates has decreased. Between 2011 and 2013, 41 doctorates were completed in comparison with only 27 in the period 2015 to 2017. FBN must increase the number of doctorates completed. According to FBN, 59 doctoral candidates were employed at the Institute at the time of the evaluation visit (including three scholarship-holders). A further 21 doctoral candidates were supervised but were no longer employed by the Institute and were expected to complete their doctorates in the near future. Against this backdrop, an increase in the number of completions was to be expected. In the opinion of the Review Board, this figure of 21 such cases is unusually high. FBN must ensure that doctoral candidates normally complete their doctoral projects during the period they are employed at FBN. FBN should also continue to ensure that doctoral candidates who have completed their doctoral work at FBN and want to stay in research relocate to other institutions.

Doctoral candidates are supervised according to the "Guidelines for Doctoral Studies at the FBN". Students can participate in various courses at FBN and the Graduate Academy of Rostock University. In addition, FBN still should develop and implement its own structured graduate programme, as already recommended at the last evaluation. The programme should be mandatory for all doctoral candidates of the six institutes and include advanced training in key transdisciplinary areas of farm animal biology. The structure of the programme could be similar to the Graduate School of the Leibniz ScienceCampus "Phosphorus Research Rostock", in which FBN participates with a few doctoral candidates. Furthermore, it is recommended to introduce thesis committees.

Vocational training for non-academic staff

FBN can boast excellent expertise in the non-scientific sector. It enables its employees to regularly upgrade their qualifications to ensure that modern equipment systems and methods are purposefully and efficiently operated.

The number of traineeships at FBN is appropriate. FBN offers training positions for biological laboratory assistants and cattle farmers. Between 2015 and 2017, five trainees completed their vocational training. Since 2015, two new biology laboratory assistants have been hired annually on the basis of demand assessments for the coming years. It is welcomed that FBN is planning to offer traineeships for pig farmers and office management clerks as well.

6. Quality assurance

Internal quality management

FBN has appropriate tools for internal quality management. Its guidelines on safeguarding good scientific practice are based on the relevant DFG and Leibniz Association guidelines and also include information on predatory journals. Part of safeguarding good scientific practice includes archiving research data for at least 10 years after they have been collected, according to FBN's Research Data Policy.

Control and selection of scientific projects within the programme budget is undertaken by the Science Committee that is composed of the Director of FBN and the six heads of institutes. It monitors ongoing FBN research projects and selects new research projects to be presented to the Scientific Advisory Board (see below).

FBN employs Leistungsorientierte Mittelvergabe (performance-related funding, LOM). In 2014-2018, between €1.15 m and €1.33 m per year were made available to researchers as core budget funds, of which 60 percent were distributed according to LOM. LOM is based on criteria such as quantity and quality of publications, with a bonus for inter-institutional publications, or for first, senior, and/or corresponding authors of publications in journals with impact factors >5, or on extramural funding, with a bonus for coordinating EU projects. The relevant data are continuously recorded in the Research Information and Research Data Management system.

In addition, FBN has introduced an internal competitive programme for establishing doctoral positions. Following a decision by the Director and members of the Scientific Advisory Board on 13 proposals, eight positions were filled.

Quality management by the Scientific Advisory Board and Board of Curators

Scientific Advisory Board

The Scientific Advisory Board (SAB) provides advice to the Director and the Board of Curators. It is welcomed that the SAB has become more international and that the annual meetings are now held in English. It is also welcomed that more members of the SAB are female researchers. In view of the application oriented research at FBN, it should be examined to what extent relevant expertise can be included on the SAB.

FBN's SAB has conducted two audits since the last evaluation (2016 and 2018). In the future, audit reports should evaluate the performance of both FBN as a whole and the individual institutes in more detail, as recommended at the last evaluation.

Board of Curators

The Board of Curators is composed of four representatives of the *Land* Mecklenburg-Vorpommern and the federal state, the Chairperson of the Scientific Advisory Board (SAB) and two additional researchers. The SAB Chairperson should be a non-voting member in line with standard practice at Leibniz institutions.

The Chairperson of the Board of Curators is elected from the members of the board. Currently, this is one of the two scientific members who was previously the long-term Chairperson of the SAB. He is head of the department at the University of Bonn in which FBN's Director completed his habilitation. They have also co-authored a number of publications. In order to ensure independence of the Board of Curators, it is recommended that the Chair of the Board of Curators is refilled and that conflicts of interest are avoided in the future.

It is welcomed that the Board of Curators has facilitated access to the Institute's exceptional research infrastructures for external users. This had been urgently recommended at previous evaluations (see Chapter 2). The Board of Curators must, however, continue to direct its attention much more clearly to the scientific demands a Leibniz institution is expected to fulfil. This is particularly true with regard to joint appointments (see Chapter 4). The relevant knowledge is pooled in the Science Department of the state government. **Attention is drawn to the recommendation issued by the Leibniz Senate to locate responsibility for FBN in the Mecklenburg-Vorpommern Science Department, which is already responsible for all other Leibniz institutes in the *Land,* and which can ensure appropriate scientific supervision.**

Implementation of recommendations from the last external evaluation

With reference to the implementation of the recommendations issued by the Senate of the Leibniz Association at the last evaluation (highlighted here in *italics*, see also Statement of

the Senate of the Leibniz Association of 26 November 2015) the Review Board states the following:

1) In order to develop more innovative topics and improve research performance, the FBN must receive considerably ***more external input****: in particular, a more intensive exchange of personnel with the international scientific community. In the past, vacancies in the scientific field were too often filled in-house; thus, more international scientists should be employed at FBN.*

FBN continues to be called upon to further intensify scientific exchange with the international scientific community (see Chapter 5).

2) The FBN has improved its publication performance since the last evaluation, but still lacks publications in higher and top-ranked journals. A more ambitious ***publication strategy*** *should therefore be pursued. Overall, the publication performance of FBN must increase significantly.*

FBN has managed to enhance its publication performance but must improve it yet further (see Chapter 2).

3) It is incomprehensible that the outstanding ***infrastructure*** *of the FBN can only be used to a very limited extent by external scientists, which had already been criticised in the last evaluation. As is usual for Leibniz Institutes, scientific services that the FBN can and wants to provide should be developed and offered according to the possibilities and strategic goals of the Institute. If the Board of Curators sees an obstacle to implementing this important recommendation in the FBN's statutes, the statutes must be amended accordingly.*

This recommendation, already issued at the evaluation before last in 2008, was implemented with a change to the statutes in 2017 (see Chapter 2).

4) Although the amount of ***third-party funding*** *has increased since the last evaluation (in 2013, it amounted to approximately EUR 2.5 million or 12.6% of total revenues), it is still too low in terms of the Institute's capabilities. In particular, more funds should be raised from the DFG and the EU in the future. The self-imposed goal of financing 15 to 20% of the total budget with third-party funds is not ambitious enough, even taking into account the high proportion of employees in the non-scientific sector (especially in the laboratory and animal care sectors).*

Third-party income decreased since the last evaluation (see Chapter 2).

5) It is welcomed that an agreement has been reached with University of Rostock to jointly fill up to five additional professorships (W2) in addition to the position of the Executive Director. According to the requirements of Leibniz Institutes, leading positions in the scientific field should generally be filled in a joint appointment procedure with universities. In the future, the FBN should ***link joint professorships to the management of one of its six sub-institutes*** *and advertise them accordingly.*

This recommendation is still valid (see Chapter 5).

6) Against the background of the size of the Institute, the outstanding scientific infrastructure as well as the improved university connections via the additional joint appointments, the FBN should further increase the number of ***doctoral students****. In addition, it is recommended to encourage young scientists to seek external follow-up employment after completing their doctorate in order to improve their scientific qualifications through new experiences at other institutions, if possible, also abroad.*

Since the last evaluation, the number of completed doctorates has dropped and strategies should be developed and implemented to increase this number again. FBN should continue to ensure that doctoral candidates who have completed their doctoral work at FBN and want to stay in research relocate to other institutions (see Chapter 5).

7) It is gratifying that the FBN acquired a graduate school as part of the Leibniz Association's competition procedure (2010–2013) with the universities of Kiel and Rostock. Based on the established structures and the cross-institutional further training offers already offered, a ***structured training framework and long-term training policy for all doctoral students*** *of the FBN should be developed.*

For the implementation of this recommendation see Chapter 5.

8) The establishment of the ***Junior Research Groups and the tenure-track procedure*** *at the FBN is very welcome. So far, however, too many in-house candidates have been hired for these positions despite international calls for applications. The FBN should base its procedures and criteria for filling tenure-track positions on internationally recognised standards, such as those applied in the DFG's Emmy Noether Programme or in the evaluation of junior professorships. In particular, it must ensure that the persons in question have gained several years of experience outside the FBN, preferably abroad. Whenever possible, external expertise beyond the FBN committees should also be included in evaluating candidates for permanent positions.*

Since the last evaluation, FBN has established two new Junior Research Groups. Both leadership positions were filled with individuals from outside of FBN. The decision to tenure heads of Junior Research Groups (or other scientists) is also informed by the opinions of a member of the Scientific Advisory Board and an external scientist (see Chapter 5).

9) The reports of the ***Scientific Advisory Board (SAB)*** *should include a more detailed assessment of the performance of individual FBN Institutes. In addition, the proportion of women among the members of the SAB should be increased and more internationally renowned members should be recruited from abroad.*

The written reports on the audits should be more detailed still in their evaluation of the performance of both FBN as a whole and the individual institutes (see Chapter 6). The other recommendations have been implemented: the SAB is now composed of four domestic and four foreign scientists; three female and five male members.

Appendix

1. Review Board

Chair (Member of the Leibniz Senate Evaluation Committee)

Andreas **Weber**	Institute for Plant Biochemistry, Düsseldorf University, Germany

Deputy Chair (Member of the Leibniz Senate Evaluation Committee)

Martina **Löw**	Department of Sociology, Technical University of Berlin

Reviewers

Heiner **Bollwein**	Clinic of Reproductive Medicine, Department of Farm Animals, Vetsuisse-Faculty University Zurich, Switzerland
Bertram **Brenig**	Institute of Veterinary Medicine, University of Göttingen
Jack **Dekkers**	Professor for Animal Breeding and Genetics, Iowa State University Ames, USA
Stefaan **De Smet**	Professor for Animal Science, Department of Animal Sciences and Aquatic Ecology, Ghent University, Belgium
Shawn S. **Donkin**	Professor of Animal Sciences, College of Agriculture, Purdue University, USA
Gerhard **Heldmaier**	Animal Physiology, Research Area Development and Function, Philipps-Universität Marburg
Wouter **Hendriks**	Animal Nutrition, Department of Animal Sciences, Wageningen University, The Netherlands
Linda **Keeling**	Professor of Animal Welfare, Department of Animal Environment and Health, Swedish University of Agricultural Sciences, Uppsala, Sweden
Heiner **Niemann**	Hannover Medical School, TwinCore
Hans-Peter **Piepho**	Professor for Biostatics, Institute for Crop Science, Hohenheim University
Grazyna **Ptak**	Developmental Biology Group, Malopolska Centre of Biotechnology, Jagiellonian University, Krakow, Poland
Susanne **Waiblinger**	Institute of Animal Husbandry and Animal Welfare, Department for Farm Animals and Veterinary Public Health, University of Veterinary Medicine Vienna, Austria

Representative of the Federal Government (Member of the Leibniz Senate Evaluation Committee)

absent with apologies	Federal Ministry of Education and Research, Bonn

Representative of the Länder *Governments (Member of the Leibniz Senate Evaluation Committee)*

Claudia **Herok**	Ministry for Science, Research and Culture of the State of Brandenburg, Potsdam

4 October 2019

Annex C: Statement of the Institution on the Evaluation Report

Leibniz Institute for Farm Animal Biology, Dummerstorf (FBN)

The FBN is grateful to the chair, the co-chair and the members of the Review Board as well as the guests and the staff of the Evaluation Division of the Leibniz Association for the professional evaluation and for the constructive criticism and valuable recommendations which will be implemented. In the following we comment on aspects of the report that we consider important to highlight crucial changes made during the last evaluation period.

General concept and profile

The Review Board states that the FBN conducts basic and applied research contributing to technological developments and consultancy services as well as important technology and knowledge transfer activities. The reviewers endorse that innovative applications were developed, patented and implemented in the field as well as consultancy services are provided by the FBN not covered by other departmental research institutions.

To take on current societal challenges and to transform these into scientific solutions the FBN has revised its research strategy and restructured its research matrix. The Review Board confirms that in the evaluation period 2015-2017 the FBN has improved the coherence of the research work and cooperation among the six institutes by focusing on now three programme areas comprising several thematic clusters each. This newly set up research programme has become the framework of the initiated change process after the evaluation 2015 and is actively supported by the Board of Curators and the Scientific Advisory Board. The new clusters in particular serve as focal points for interdisciplinary exchange and the development and elaboration of innovative projects in flexible project groups comprising all six institutes and supported by competitive seed financing. Our newly set up research strategy enables us to further promote the change process. Thereby we pursue our strategy of deep phenotyping addressing the conflicting goals of animal health and welfare, resources efficiency and environmental impact, with biodiversity and exploiting adaptation being seen as part of the solutions. Based on the fact that livestock is a central element of the agricultural circular systems FBN's strategic goal is to understand animals and sustainably improve animal husbandry through excellent research. Key element of this approach is the translation of our fundamental research, as demonstrated for example in bioacoustics, nutrient metabolism or genome annotation, into innovative applications and new tools for monitoring and improving animal welfare, methane emissions, and resilience.

The strategies for performance-related funding and for publication have been revised and have already shown some of the anticipated effects. The number of publications in higher ranking journals (impact factor > 5) was doubled and the mean impact factor sum per scientist and year improved from 3.6 to 6.1 in the last evaluation period. This was achieved while maintaining the quantity of publications. More than 2/3 of our publications are in top ranked journals of the relevant categories (Q1 of Journal Citation Reports, InCites JCR, Clarivate Analystics). Our publication and performance-related funding strategy will continue to put more emphasis on the quality and visibility of publications than on quantity. A very recent example of the positive development is an interdisciplinary study on consequences of heat stress involving three FBN institutes which was recently published in Proc. Natl. Acad. Sci. USA (Koch et al. 2019).

The evaluation report welcomed the revised strategy for acquisition of third-party funding and the employment of a supporting scientific officer. The third-party income in the current short evaluation period is largely due to the extent of the third-party funding acquired in the previous evaluation period. We appreciate that the Review Board recognized the improved acquisition of new third-party funds of 3.6 and 4.5 m € including 1.1 and 1.7 m € of DFG funding in 2017 and 2018, respectively. Measures of our third-party funding strategy, including seed funding, collaborative projects developed in the clusters, and the employment of a scientific officer for fund acquisition will further promote this development, in particular in the weaker rated institutes. The FBN has committed itself to continue its efforts to further improve these performance indicators. An early indicator of the success of our strategy, as acknowledged by the Review Board, is the FBN initiated and coordinated EU-project BovReg starting in 2019 and involving 17 renowned scientific partners of 13 countries.

The evaluation committee acknowledged that the FBN has made its infrastructure available to external researchers in terms of scientific service by amendment of its statutes. It is also welcomed that the FBN instantly established the administrative framework to provide scientific service and already participates in the European Infrastructure project ('SmartCow') and coordinates a BMBF funded project for service and KTT. The establishment of six Service Groups and of the Core Facility 'Metabolomics' further promotes the provision of infrastructures, high-end equipment and expertise within and outside the FBN.

The FBN regrets that the temporary extraordinary item of expenditure, a MRI, is not endorsed. The MRI would have underpinned our deep phenotyping approach of characterizing animal as a system by enabling spatial and temporal high-resolution insights into structure and function of intact organisms and thereby promoting 3R rules. Meanwhile we will concentrate on using the existing expertise and infrastructure to continue addressing innovative aspect of farm animal biology towards a sustainable circular bioeconomy.

Staff development

The FBN currently has three professorships jointly appointed with the University of Rostock. In accordance with the cooperation agreement with the FBN, all joint appointments at the University of Rostock were advertised internationally well before the respective institute head positions became vacant and were filled on the basis of an unanimous vote of the University Appointment Committee and the FBN Selection Committee. Vacant positions at FBN and available joint professorships at the University were thus completely filled. As the report of the Review Board refers to the time before the last evaluation, indeed, since 2009, two of three vacant heads of institute positions were filled with jointly appointed professors. The position of the director of the FBN was advertised in January 2014 together with the University of Rostock as W3 professorship and filled based on a joint vote of the two committees in 2016. In the current evaluation period, the head of the Institute of Genome Biology took over this position (2018) and also holds a joint professorship, after a regular appointment procedure with the University of Rostock was completed in 2014. The current director of the FBN and the new head of the Institute of Genome Biology had previously rejected primo loco calls for professorships at the University of Hohenheim (W3) and Giessen (W2), respectively. The three long-standing, permanently occupied positions as head of institute, which will become

vacant between 2022 and 2027, will be internationally advertised as a joint appointment with the University of Rostock, as already laid down in the personnel development concept of the Faculty of Agricultural and Environmental Sciences, according to the guidelines of the WGL. The recruitment processes will be supported by head hunting to find excellent candidates. We like to point out that FBN has taken measures that from 2018 onwards joint professorships can be nominated with the University of Greifswald.

To further increase its visibility in the international community the FBN has intensified its efforts to attract leading scientists from outside to fill positions in the Institute. New groups have been established conducting innovative studies on the “circadian clock” of animals, on metabolic and epigenetic changes explaining age-related cognitive impairment - both taking advantage of the FBN long-term selection mouse lines - and growth physiology of aquaculture fish. The FBN continues to strengthen its strategic partnerships with important players in the field of farmed animal research such as INRA (France), Wageningen University (The Netherlands), ILRI (Kenia, Ethiopia), Nanjing Agricultural University (China) and others.

The Review Board states that doctoral candidates at FBN are supervised in interesting projects. The number of doctoral students currently supervised could already be increased due to the increasing number of granted, externally funded projects in recent years. The average duration of doctoral studies at FBN is 4.3 years and 80% of the doctoral projects previously started have been successfully completed since 2014. According to the Guidelines for Doctoral Studies (May 2016) doctoral candidates have to take part in mandatory transdisciplinary courses at the FBN (e.g., weekly Interdisciplinary Lecture Series "Farm Animal Biology", an obligatory course on applied statistics plus at least one of a series of advanced methodology training courses). The latest rise in the number of beginners is anticipated to translate into a corresponding increase of completed doctorates. The FBN will follow the recommendation of the Review Board and immediately introduce thesis committees according to the Leibniz Career Guidelines for the Doctorate Qualification Phase to be adopted by the Leibniz General Assembly in late 2019. In addition, FBN will continue to further develop the training programme into a structured graduate programme until 2021.

Quality management

With its resolution of 6 May 2019, the Board of Curators has already initiated or implemented all steps to amend the Foundation Act, the Statutes and Rules of Procedure of the FBN in order to regulate the composition of the Board of Curators and the voting right of the Scientific Advisory Board Chairperson in the Board of Curators in accordance with the recommendations of the Review Board. Also regulations for filling leading positions at FBN will be laid down in the Statutes and not in the Rules of Procedure.

The chair of the Board of Curators is a well renowned scientist, former dean and member of the University Council at the University of Bonn and various other committees, who fills the position of the chair of the Board of Curators with great commitment, experience, foresight, independence and careful discernment. The aspect of a possible conflict of interest will be given even greater importance in the imminent replacements of members of the Board of Curators.

Concerning the affiliation of the FBN to the Mecklenburg-Vorpommern Ministry of Science and Education, it is pointed out that the ministerial supervision is already shared among the Ministry of Science and Education and the Ministry of Agriculture and Environment. In view of the specific nature of FBN's scientific tasks and thematic orientation, both ministries have endorsed this procedure of shared supervision. The decision on the location of the formal responsibility remains with the government of Mecklenburg-Vorpommern.

Supported by the Board of Curators and the Scientific Advisory Board we will continue to further advance our institute as competence and resource centre for farm animal biology aiming at excellent research with high societal relevance and well recognized by the national and international scientific community.