

## **Concept Note**

# **African-German Centre for Sustainable and Resilient Food Systems and Applied Agricultural and Food Data Science**

- External version -

### **Framework**

Within the framework of the German Federal Government's Round Table on "Internationalisation of Education, Science and Research" and its thematic cycle "Creating Perspectives in Africa", various ministries seek to combine their funding mechanisms with the aim of achieving more efficient use of funds, broader utilisation of research results and a more sustainable transfer effect in all partner countries. Against this background, four working groups have been assigned the task to develop concepts on the central themes for the region: 1) health, 2) agriculture, 3) water and 4) administration.

Taking into account the positive experience and success story of the DAAD programme "Centres of African Excellence", which has been funded by the Federal Foreign Office (Auswärtiges Amt, abbreviated AA) since 2008, Working Group 2 (WG2 – Agriculture), under the leadership of the Federal Ministry of Food and Agriculture (Bundesministerium für Ernährung und Landwirtschaft, abbreviated BMEL), and Working Group 4 (WG4 – Administration), under the leadership of the Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung, abbreviated BMBF), developed a joint concept to establish an "African-German Centre for Sustainable and Resilient Food Systems and Applied Agricultural and Food Data Science".

The concept is based on a joint approach between the AA (funding of the basic structure of the new centre), the BMEL (funding of the (Post-)Doctoral programme) and BMBF (funding of the thematical research chair and accompanying research funds). On the South African side, the National Research Foundation (NRF) plans to provide funds for the establishment of a research chair in South Africa and for financing accompanying measures, subject to a final decision; according to the NRF, initial funds could be made available by the responsible Department of Science and Innovation (DSI) from the financial year 2024 (beginning April 2024).

The areas of teaching/learning, promotion of young researchers, capacity building, research and knowledge transfer are to be brought together in the overall concept via a holistic

approach; furthermore, an interdisciplinary approach is applied thematically. The central stakeholders would be actively involved in all phases of a research and innovation cycle so that the transdisciplinary approach anchored in the Agenda 2030 could be comprehensively implemented.

## Objective of the planned Centre of African Excellence and preliminary work

### 1. On the overarching strategic context

In the context of the participation of the above-mentioned ministries and the embedding of the project in the existing and AA-financed DAAD funding programme "Fachzentren Afrika - Centres of African Excellence", the multi-institutional character of the overall project is also reflected in the intended longer-term goals and the expected impacts. The implementation of the new Centre of Excellence must therefore be seen in the overall context of the Federal Government's Africa policy guidelines, whereby both the strategic goals of foreign cultural and educational policy (AKBP), the BMBF's Africa strategy, the BMEL's Africa concept in the 2020 version (currently being revised) and thus also the implementation of the UN Sustainable Development Goals (SDGs) come into play. This also includes the "Future Strategy for Research and Innovation" as well as strategies for the internationalization of education, science and research. In this sense, the project also contributes to strengthening applied, practice-oriented, interdisciplinary and transdisciplinary international research cooperation and to establishing efficient, internationally networked and innovation- and research-oriented universities (cf. also Annex 1 - Impact structure of the overall project).

### 2. Thematical Focus

The climate crisis, declining biodiversity, limited and non-renewable natural resources are acute problems that pose key challenges to the growing world population at present and in the future, which constitute among other things a concrete threat to food security globally and especially on the African continent. Environmentally friendly and resource-saving agriculture, including efficient and sustainable land use, transparent and sustainable value chains as well as new approaches to food production and sales methods, but also a concrete rethinking of current consumer behaviour must become important topics, taking into account social framework conditions, in order to meet the above-mentioned challenges and develop sustainable solutions for the future. These include agro-ecological approaches (such as organic farming), which can contribute to the transformation process towards sustainable and resilient food systems. It is envisaged that education policy initiatives and trans- and interdisciplinary scientific approaches and training pathways will involve all necessary stakeholders – from decision-makers to, among others, smallholders, commercial farmers, processing industries and plants, traders and consumers.

The planned Centre of Excellence is to bring together the thematic aspects of food production, processing, marketing and consumption for the areas of education, research and transfer in

such a way that food systems can be considered within the framework of a holistic approach. Environmentally friendly and resource-conserving agriculture, as well as organic farming as the most sustainable form of agricultural management, reduce climate risks - also in the interest of sustainable rural development - and serve to preserve healthy ecosystems, while at the same time improving the framework and conditions for balanced growth of supply and demand. All of this takes place at the interface between producers and consumers, as all involved sectors of the production chain are taken into account - starting from agricultural production itself, through collection, processing, marketing, and ending with consumers.

A holistic view of food systems and their subcomponents also requires a direct link to neighbouring systems such as health, ecology, economy, and governance, as well as to science and innovation systems (see Fig. 1):

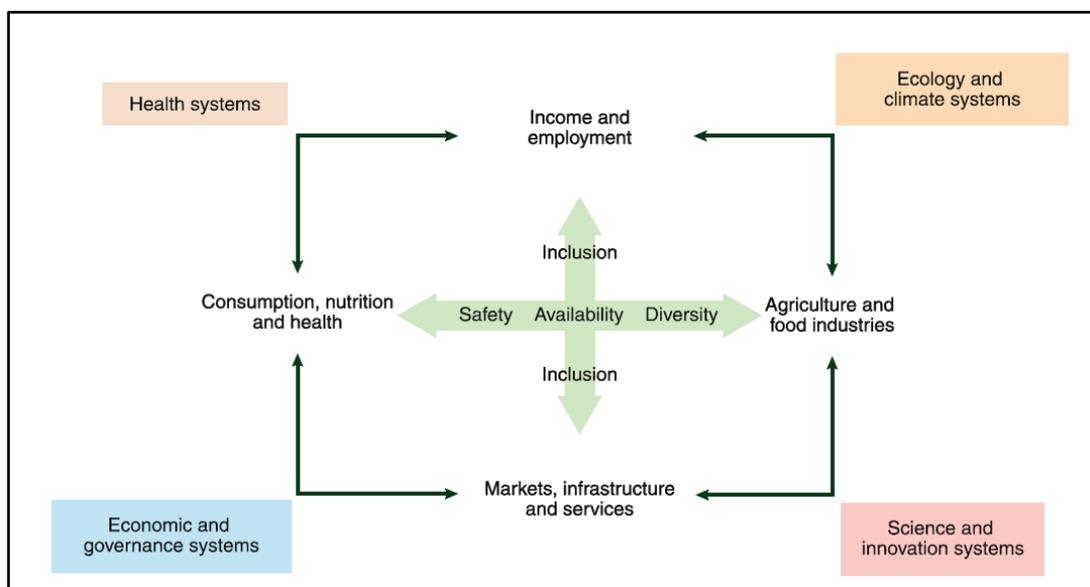


Fig.1: The food system in relation to other systems, Source: Joachim von Braun, Kaosar Afsana, Louise O. Fresco, Mohamed Hag Ali Hassan 2023, p. 13<sup>1</sup>.

Since this holistic "food systems" approach aims to bring together or link the above-mentioned areas or systems, there is a clear connection to the planned Centre of Excellence. Furthermore, there are parallels to the holistic view of the human-animal-environment-health nexus, which is reflected in the integrated and interdepartmental One Health approach, among others.

The promotion of ecologically oriented and climate-friendly agricultural systems, sustainable and resilient food systems, and the associated strategies for reducing food losses and food waste along the entire value chain thus serves to secure the livelihoods and economic bases of the population and can be adapted to current global and regional challenges within the framework of research-based knowledge generation.

<sup>1</sup> Joachim von Braun, Kaosar Afsana, Louise O. Fresco, Mohamed Hag Ali Hassan (2023), Science and Innovation for Food Systems Transformation, Springer-Verlag

An integral and particularly forward-looking component for the planned Centre of Excellence is also the interlinking with the field of data science: the data- and research-based use of topic-relevant findings and their integration into the process of knowledge generation with regard to resilient and sustainable food and agricultural systems, as well as the implementation and translation of the findings into concrete activities, was identified as a clear added value during the preliminary work and is an important component for the success of the overall project as an innovative solution approach.

### **3. Delegation Visit – Fact Finding-Mission September 2022**

After a Stakeholder Analysis and a subsequent Stakeholder Workshop in spring 2022, a Delegation Visit to South Africa took place at the beginning of September 2022 including the most important institutions involved on the German side, namely BMEL, BMBF and DAAD, whereby the DAAD would participate with funds released from the programme “Centres of African Excellence” after consultation with the AA. In addition, a representative of a German research institution (Leibniz Centre for Tropical Marine Research, ZMT, Bremen) accompanied the delegation as well. The aim of the visit was to explore whether the chosen interdisciplinary topic, the claim of a transdisciplinary approach, the implementation format of a Centre of African Excellence and a possible and sufficient own participation of the local partners to ensure sustainability corresponded at all with the interests and possibilities of the South African partners.

The urgent need for such a centre was explicitly confirmed in the various discussions. The following points were continuously underlined and welcomed by the South African side (political and academic institutions):

- the contemporary, innovative interdisciplinary topic that meets current needs
- the transdisciplinary approach, which is to involve stakeholders in research and transfer processes more actively than before (kindly note: "transdisciplinarity" is currently the No. 1 science policy topic of the future in South Africa)
- the involvement of a partner institution from another country in sub-Saharan Africa, as there are corresponding funding policies and professional interests at all the higher education institutions surveyed
- the "capacity enhancement approach" geared towards the development of in-service "micro degrees" and the teaching of "soft skills" (among other things for the implementation of transdisciplinarity including in digital formats such as on the digital platform [www.digiface.org](http://www.digiface.org))
- the accompanying thematic doctoral programme (incl. postdocs) with start-up funding for the corresponding research projects

- the general possibility of funding one to two “core Research Chairs” in South Africa/sub-Saharan Africa and the availability of supplementary research funds to be able to realise the elaborate approach.

#### 4. Structure of the Centre of Excellence and application requirements

The structural and conceptual basis of the new centre is the model of the DAAD’s Centres of African Excellence ([African Excellence – Centres of African Excellence - DAAD](#)) which has been established since 2008 and which was evaluated as suitable and feasible in the course of a stakeholder analysis. In particular, the flexibility of this model, in which new components such as research and transfer can be integrated, is considered promising:<sup>2</sup>

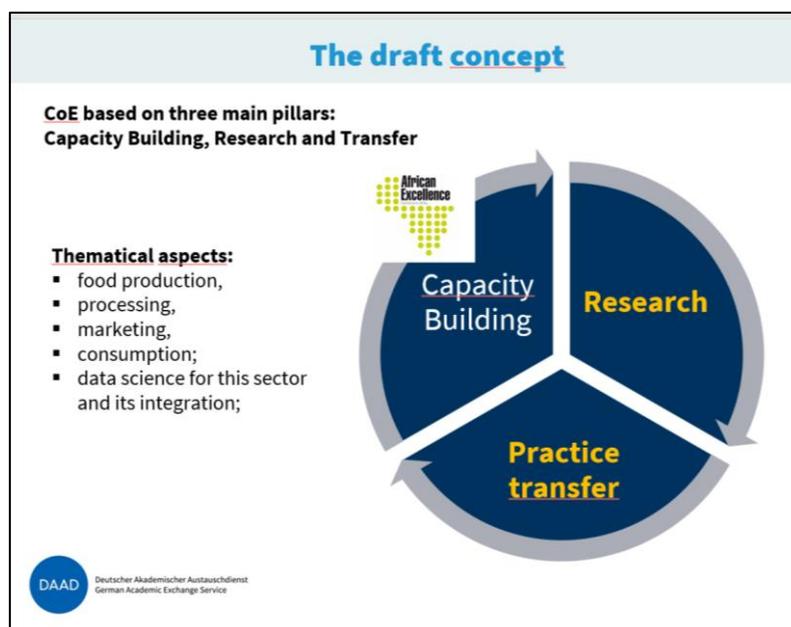


Figure 2: The three pillars of the new centre

According to the working result of the responsible WG2, the geographical starting point should be sub-Saharan Africa - with **South Africa** as the main location of the planned new Centre of Excellence, whereby the country should take on a hub function that should have an impact far beyond the borders in the region of southern Africa. South African universities have excellent networks throughout the African continent due to the origin of many of their lecturers and due to corresponding science policy guidelines. Thus, through a trilateral or multilateral centre on the one hand, they can use their excellent equipment and scientific quality; on the other hand,

<sup>2</sup> Figure 1: DAAD-Präsentation „Concept of the new African-German Centre for Resilient Food Systems and Applied Data Science“, 04.09.2022

they can contribute their knowledge of transdisciplinary problems as well as their various contacts not only in Southern Africa, but throughout the whole continent.

Moreover, climate change, climate impact research, watersheds, trade relations, agro-economic transformation processes as well as the associated socio-economic impacts do not stop at South Africa's borders, which is another reason for a cross-border cooperation with further partners from sub-Saharan Africa. Regarding the basic structures, the envisaged novel features of the centre (e.g. practice-oriented modules, use of large amounts of data, transdisciplinary approach, close stakeholder involvement in applied research) are to be designed from the very beginning through joint trilateral or multilateral processes and in such a way that they can be usable not only in South Africa, but also in other countries in sub-Saharan Africa. An outstanding partner from another country in sub-Saharan Africa (presumably an institution with which both the South African and the German university already cooperate) should therefore be integrated into the development of the centre's concept from the very beginning. Other potential and interested partners from the region could be involved in various sub-projects/sub-measures/conferences and the like. In addition, the centre is to be closely integrated into the already existing network of the Centres of African Excellence of the DAAD (funded by the AA), which is a stable network with long-standing and established cooperations with various partners in West and East Africa (e.g. Ghana, Mali, Senegal, Niger, Kenya, Tanzania, Namibia or Uganda).

Due to the broad thematic focus of the new centre, potential synergies with the NRF-funded "Centres of Excellence" (CoEs)<sup>3</sup> as well as with the "World Bank Centres of Excellence" (ACE)<sup>4</sup> should also be explored. In addition, contacts with other DAAD programmes such as the "Global Centres for Climate and Environment" as well as for Health and Pandemic Prevention<sup>5</sup> could be established through the DIGI-FACE platform. The platform is used,

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<sup>3</sup> The Department of Science and Innovation (DSI) and National Research Foundation (NRF) Centres of Excellence (DSI/NRF CoE) of South Africa are physical or virtual research centres that pool existing research excellence, capacity, and resources to enable researchers to collaborate across disciplines and institutions on long-term projects that are locally relevant and internationally competitive. The DSI/NRF CoE funding instrument was launched in 2004 with the establishment of seven CoEs. Since then, three more CoEs were established between 2009 and 2013, and five new CoEs were established in 2014 (including the DSI-NRF Centre of Excellence in Food Security (FS)). The five pillars on which the CoEs are based are the following: Research/Knowledge Production, Education and Training, Information Dissemination, Networking and Services. (<https://www.nrf.ac.za>, last access 24.03.2023)

<sup>4</sup> The Africa Higher Education Centres of Excellence (ACE) project is a World Bank initiative in collaboration with participating country governments to support higher education institutions specialising in science, technology, engineering, and mathematics (STEM), environment, agriculture, applied social sciences, education and health. This is the World Bank's first project aimed at building the capacity of higher education institutions in Africa. Since 2014, the programme has become synonymous with quality and relevant postgraduate education that meets skills needs in relevant fields. Between 2014 and 2020, over 14,000 master's students and doctoral candidates were supported in agriculture, health and other sciences. The programme is being expanded across the sub-Saharan Africa region and focuses on improving teaching and learning, expanding access to higher education and research, and addressing sustainability (ACE - <https://ace.aau.org>, last access 24.03.2023)

<sup>5</sup> The DAAD programme "Global Centres for Climate and Environment" supports the establishment of international centres at universities in the Global South, where foreign and German researchers teach and research together and promote social change in dialogue with business, politics, and civil society. The aim is to make a German contribution to overcoming the crises of our time. The Global Centres are financed via AA funds within the framework of the AKBP (Foreign cultural and educational policy). ([www.daad.de](http://www.daad.de), last access, 24.03.2023)

among other things, to make teaching content, modules, and entire curricula available digitally and to develop e-learning offers; furthermore, another focus is on capacity and competence development modules for different target groups, including multiplier trainings. The application of sharing approaches within digitally supported knowledge networks is also intended to promote synergy effects, knowledge exchange and the visibility of regionally specific research activities, especially in postgraduate teaching and in research cooperation. This aspect would be given particular weight due to the planned research focus of the new centre, including the intended regional outreach to other countries in sub-Saharan Africa.

As an institutional basis, both the stakeholder analysis and the subsequent stakeholder workshop had initially identified three potential universities in South Africa (University of the Western Cape / UWC, University of Pretoria / UP, Stellenbosch University / SU). These three institutions already maintain existing partnerships in the Southern African region (including Botswana, Zambia, Malawi) as well as in the sub-Saharan African region (including Kenya, Ghana) and clearly expressed their willingness to act as host institution for the planned Centre of Excellence during the on-site discussions.

Contrary to the original idea that at least one of the aforementioned universities would have to be involved in the start-up of the new centre, it was decided during the delegation trip to now provide an open call for proposals. This decision has been taken also due to the express request of the South African partners including the pre-selected universities.

According to the DAAD requirements and regarding the envisaged open call for proposals, the applying lead university and thus the grant recipient (later to be identified by the independent selection committee) has to be based and recognised in Germany. The applying German higher education institution should then include at least one potential South African host institution as a project partner in the application; the corresponding confirmation from the selected partner must be submitted with the application documents. In addition, and analogous to the results of the validation workshop, further associated partners on the South African side shall also be included in the application (e.g. historically disadvantaged (HDI) or emerging institutions,<sup>6</sup> or an already existing network). The disadvantaged universities are supported by the state in South Africa for historical reasons, so that they can achieve their strategic goals and further develop the quality of their teaching programmes. Their participation in international projects is also explicitly desired by the South African Department of Agriculture. The involvement of HDI in the proposed Centre of Excellence is beneficial to all parties involved, as the project itself as well as the multi-institutional

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<sup>6</sup> The so-called Historically Disadvantaged Institutions (HDIs) are universities that were established as "non-white" universities on the recommendation of the Eiselen Commission in 1959. In 2013, the democratic South African Government set up a committee to review the funding of universities across the country with the aim of addressing past injustices. The ministerial committee's report on the review of university funding, presented in October 2013, classified eight institutions as "historically disadvantaged institutions" (HDIs) from 2015/16: University of Fort Hare, University of Limpopo, University of Venda, Walter Sisulu University, University of the Western Cape, University of Zululand, Mangosuthu University of Technology and Sefako Makgatho Health Science University. Due to historical inequities, the HDIs are not well off financially, which is why the state supports the HDIs financially through special programmes so that they can achieve their strategic goals (structures, sustainability, etc.) and enter into international cooperation, among other things, to build research capacities (cf. website [dhet.gov.za](http://dhet.gov.za), last access: 20.03.2023).

collaboration opportunities will enable HDI to train more junior academics and researchers, who will in turn contribute back to effective change at these institutions. Alternatively, the applicants can describe in their concept how they intend to actively shape the cooperation with this university group as a whole or with selected partner universities.

The size<sup>7</sup> of the core consortium should be limited to four (with possible associated partners up to a maximum of five) institutions, to better ensure the binding nature of agreements and the correct use of funds by the various partners. The use of synergies with already established and thematically relevant projects and institutions on site and/or in the region is explicitly desired; in this context, for example AIMS (African Institute for Mathematical Sciences)<sup>8</sup>, SASSCAL (The Southern African Science Services Centre for Climate Change and Adaptive Land Management)<sup>9</sup>, GIZ (German Society for International Cooperation)<sup>10</sup>, Fraunhofer-

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<sup>7</sup> See also Figure 2: Structure of the consortium of the new Centre of Excellence – DAAD Slide new – Page 10

<sup>8</sup> Pan-African network of centres of excellence promoting mathematics and science (STEM subjects) at postgraduate level in general and the education of talented African students and teachers in particular, with the aim of making them pioneers for the continent's self-reliance in science, education and business. Locations in South Africa, Ghana, Senegal, Rwanda, Tanzania and Cameroon. Website AIMS: [AIMS Centres – We believe the next Einstein will be African](#) (last access: 01.12.2022)

Reference: AIMS scientists could form an important advisory role in the development of mathematical models and complex algorithms, especially for the field of applied data science. In addition, the doctoral researchers "search" for practical use cases for the development of innovative solution approaches.

<sup>9</sup> Competence centre for scientific support against climate change and adaptive land management in Southern Africa, funded by BMBF since 2010 as part of the framework programme "Research for Sustainable Development" (please refer also to [Bekanntmachung - BMBF](#), last access: 01.12.2022).

Website SASSCAL: [Southern African Science Service Centre for Climate Change and Adaptive Land Management \(sasscal.org\)](#) (last access: 01.12.2022)

Reference: SASSCAL has, among other things, a unique publicly accessible set of meteorological data on southern Africa, which is an important starting point for agriculture-related climate modelling and thus for the research of the planned transdisciplinary centre.

<sup>10</sup> Organisation and service provider of development cooperation, international cooperation for sustainable development and international education work with expertise in areas including economic and employment promotion, energy and environmental issues, promotion of peace and security, etc. GIZ is active internationally on behalf of various ministries of the Federal Republic of Germany; its main client is the Federal Ministry for Economic Cooperation and Development (BMZ). (For further information please refer to: [www.giz.de](http://www.giz.de); last access: 01.12.2022)

Reference: In South Africa, GIZ promotes, among other things, political communication on the SDGs in coordination with the Office of the President; it could therefore be included as one of the key knowledge holders for policy dialogue measures.

Gesellschaft e.V.<sup>11</sup>, FAO (Food and Agriculture Organization of the United Nations)<sup>12</sup>, CGIAR or respectively One CGIAR (former Consultative Group on International Agricultural Research)<sup>13</sup> and other international and multilateral organisations should be considered.

The various initiatives and projects already active in South Africa and the region offer interesting and target-oriented interfaces to the planned focus of the new centre, which are indispensable as a knowledge base and represent important synergy effects. For example, a scientific evaluation of the enormous amount of data (especially weather data) that can be made available via SASSCAL would be an enormous advantage for the new centre for original research in the field of climate impact research and agricultural adaptation in southern Africa. The call for proposals should therefore be designed in such a way that universities/research institutions must clearly demonstrate how these potential synergies (local and cross-sectoral) can be harnessed for the new centre.

In addition to the involvement of established and scientifically relevant institutions, the application should describe the transdisciplinary approach and address how important

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<sup>11</sup> The Society promoting Applied Research, with around 30.000 employees, is the largest organisation for applied research and development services in Europe and an important part of the German research landscape. Its headquarters is in Munich. Please refer to the following website for more information: [Fraunhofer-Gesellschaft](#) (last access 01.12.2022).

Reference: The Fraunhofer-Gesellschaft supports a representative based at Stellenbosch University; this representative can arrange contacts with relevant companies in the field of applied data science as well as with innovative companies with an agro-engineering profile.

<sup>12</sup> Food and Agriculture Organisation of the United Nations, also known in Germany as “Welternährungsorganisation” / World Food Organisation; specialised agency of the UN, based in Rome. The FAO's tasks focus on the issue of food security, with the aim of improving the production and distribution of agricultural products and the standard of living worldwide. International standards for food safety are defined through the development of the Codex Alimentarius. Website: [Home | Food and Agriculture Organization of the United Nations \(fao.org\)](#) (last access: 01.12.2022)

Reference: The FAO works and publishes on food systems; its know-how in this area could be included by inviting experts. FAO and CGIAR also could be seen as partners for scientific conferences to multiply innovative results.

<sup>13</sup> Advisory Group for International Agricultural Research, founded in 1971. CGIAR is a strategic partnership of 64 members (21 countries from the Global South, 26 countries from the Global North, 4 co-sponsors, 13 international organisations) and global collaboration with a wide range of governmental organisations, civil society and the private sector to address food shortages in tropical and subtropical countries through research and investment in new, highly productive crop varieties and improved livestock management. More than 8.000 scientists and staff are currently working for CGIAR in over 100 countries. Please refer to the following website: [CGIAR: Science for humanity's greatest challenges](#) (last access: 01.12.2022)

Reference: In 2021, the new CGIAR Research and Innovation Portfolio was developed, comprising 32 CGIAR initiatives aimed at modifying food, land, and water systems in a climate crisis. The new portfolio has been built based on the “CGIAR Research Programmes” (CRPs) and platforms that aim at developing a remarkable set of science-based innovations and contributions with regard to impacts and that are aligned with the United Nations SDGs and the world's most pressing challenges. This expertise could be incorporated into different areas of the planned centre. One of the initiatives, the ESA initiative, brings together the farmers' practical field experiences with agri-business through an innovative approach, knowledge which could also be used by the new centre. The exploration of the new CGIAR initiative, funded by BMZ and others, provides an opportunity to learn more about the structure of the CGIAR centres and to explore potential links with the new Centre of Excellence.

stakeholders are involved at all levels - from political decision-makers to science and universities, as well as industrially organised agricultural producers, small farmers and representatives of civil society and consumer organisations. In the context of an application, it would have to be explained in concrete terms how the aforementioned groups are to be regularly involved in the development of research questions and their continuous adaptation on the basis of available interim results (e.g. via social media and publications, via different event formats such as policy talks and public lectures, via conferences, workshops, roundtables, etc.) in the sense of an efficient transfer cycle via both target group-specific and integrative events on needs and problem analyses. Given the relevance of the topic and the diversity of African food systems, this necessary involvement of the various stakeholder groups also applies to the (non-South African) partner from sub-Saharan Africa.

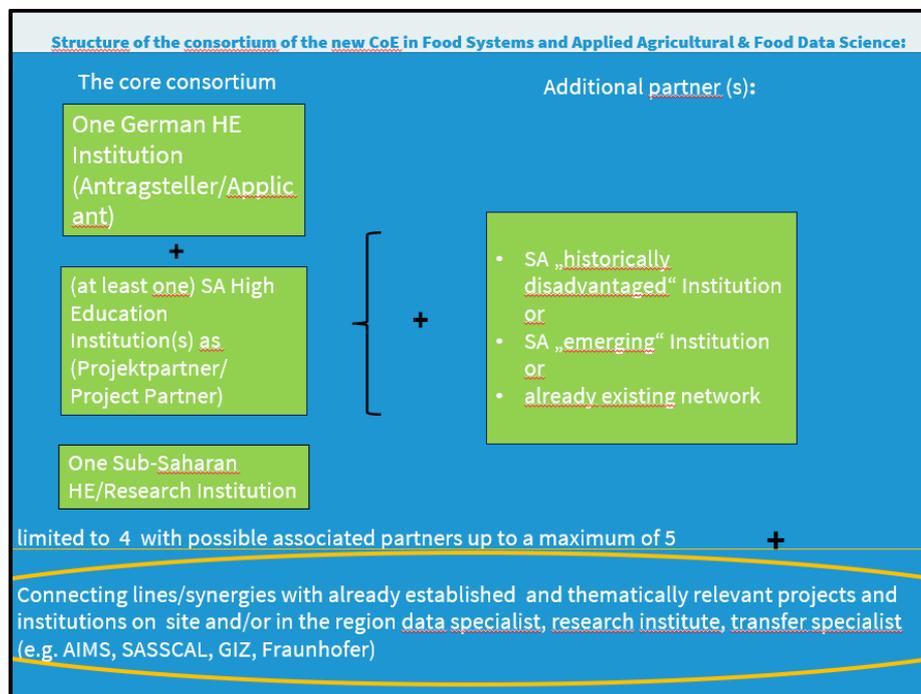


Figure 3: Structure of the Consortium of the new Centre of Excellence

## 5. Thematic orientation

In order to meet the requirements and the global significance of the complex topic of food systems, including the dimensions of production, processing, marketing and consumption, the prospective Centre of Excellence must work internationally and transdisciplinary. As for the implementation, this means that in the areas of research and teaching expertise from different disciplines must be brought together, including agricultural and nutritional sciences in the broadest sense. The following disciplinary aspects, among others, may be of importance: agroecology and organic farming; "One Health" approach (holistic view of the human-animal-environmental-health nexus, cf. above: strategic approach); forestry, sustainable forest management, integrated agro-forestry systems; sustainable

fisheries/aquaculture/aquatic systems (both in relation to coasts/oceans and inland waters); climate and environmental sciences (including climate change mitigation and adaptation in relation to sustainable food systems); food systems and food loss & food waste reduction along the value chain; relevant areas of engineering; data science and computer science; sociology and other related disciplines.

In the framework of the call for proposals, the applying universities are requested to actively point out relevant and globally active organisations, institutions, projects and research groups such as FAO, One CGIAR, GIZ, Fraunhofer, German departmental research institutes, the worldwide DAAD network as well as related DAAD funding projects such as the Global Centres or the SDG Research Training Groups and to elaborate on their possible integration in the concept proposal. This will enhance the international aspect of the Centre and its activities.

a) Research subarea:

The **research component** includes the development of conditions for sustainable food systems, having in mind the increasing impact of global climate change, as well as the development of connections between sustainable land use, agribusiness, and food security. Findings from agricultural and food-related data sciences are to be incorporated here and make decisive contributions to gaining knowledge and in the sense of a concrete application reference, for example in the analysis of soil quality and use, food quality and safety even before consumer contact, or in the evaluation of consumer acceptance of different products. Furthermore, it is important to improve the collection, archiving and use of suitable data and to expand access to existing data, while also taking data protection aspects into account.

A central component of these research approaches is the establishment of application-oriented transfer cycles<sup>14</sup>, so that research questions are fed by impulses from society and can flow back into society, economy, and politics. In this way, a transdisciplinary transformation approach is pursued that includes all stakeholders involved with the aim of contributing to sustainable and efficient change in relation to the topics of the Centre of Excellence.

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<sup>14</sup> Figure 4 – Transfer cycles; DAAD presentation "Concept of the new African-German Centre for Resilient Food Systems and Applied Data Science", 04.09.2022

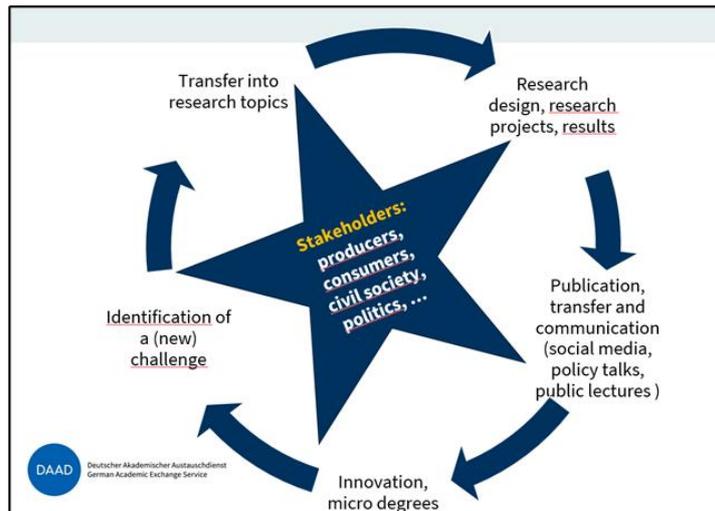


Figure 4: Transfer cycles

#### Conceivable scenario for transdisciplinary approach:

For example, it will be pivotal for South Africa, which is particularly affected by climate change, to project its likely medium-term impacts on precipitation and water availability and their effects on previous crops/livestock. In this context, the new Centre of Excellence will be able to evaluate large amounts of data and develop scenarios, especially through its novel and innovative cooperation with applied data sciences. These scenarios can now be presented to various actors within the food system (smallholders, commercial farmers, agro-processors, fertiliser manufacturers, retail chains, marketing experts, consumer representatives). Concrete research questions could be developed together with the stakeholders. These questions could either aim at new framework conditions for the further provision of a certain agricultural product (e.g. more efficient irrigation, decentralised energy supply for pumping systems, etc.) or work out options for the switch to alternative (e.g. more drought-resistant) products along the value chain. If possible, social issues (e.g. the granting of credits for conversion investments) should also be taken into account.

In the course of the research process, interim results are also fed back to the stakeholders at shorter intervals than usual and research questions are adapted if necessary. Preliminary results are made available directly in workshops/conferences and not only through publications.

#### b) Teaching subarea:

Since high-quality degrees (on Bachelor and Master level) already exist in the relevant disciplines in South Africa, the creation of another full degree in the field of "Sustainable and resilient food systems and applied agricultural and nutritional data science" is neither necessary nor beneficial. Instead, **flexible modules** should be developed to be integrated into different degree programmes of already established courses of study in South Africa and, if possible, also in another partner country and via digital offerings throughout Africa, to reach the largest possible target group of different disciplines and to contribute to constructive approaches to solutions in other countries in Africa as well.

Furthermore, academic and non-academic practice-oriented training modules are to prepare the graduates more holistically for their future careers. This also means that the Centre of Excellence must be able to operate across faculties. The modules should be designed in such

a way that they can also be used by the partner from sub-Saharan Africa (and prospectively by other partners in the region/on the continent) in the context of master's programmes.

With further training opportunities in mind, **micro-degrees** should be developed for graduates and workers in relevant fields. Cooperation with quality assurance agencies such as SAQA are to be aimed at. This allows a knowledge-based skills enhancement that has direct impact on society and the market. For South Africa in particular, this aspect of continuing education is both a political desideratum in the context of the desired practical relevance and the global controversial issues for which solutions are being sought, as well as an explicit wish of the South African higher education institutions, which also regard the "micro degrees approach" as added value. In view of the general global challenges, it is to be expected that this model could also become an international example of best practice.

c) Scholarships, promotion of young academics, doctoral programme:

**Scholarships for study purposes** (via AA funding) should be made available for a selection of the best students and young researchers, as the participation of professionally outstanding persons in the programmes is imperative in the context of a socially complex challenge such as the creation of sustainable food systems. An appropriate proportion of women is to be considered in the selection process.

In addition to **scholarships for study and further education purposes** (planned AA part), **research scholarships** (via BMEL share) should be made available in order to conduct research at home and abroad, to be able to establish networks and to gain a more differentiated insight into the food systems and their challenges in geographically different regions. At a later stage, the aim is also to establish an Africa-wide graduate network or a continental/regional subject-specific **doctoral programme**, flanked by subject-specific workshops and a guest researcher exchange.

Building on this, the development of a holistic programme for the **promotion of early career researchers** must also be given high priority, for example through the establishment of post-doctoral programmes. Their graduates must be enabled to bring together and lead transdisciplinary and international research groups.

d) Complementary research chairs and additional funding ("seed money") for smaller research projects:

To ensure high-quality support for the fellows and to promote innovative, transdisciplinary research approaches, the envisaged Centre of Excellence will be supplemented by an NRF-funded research chair for South African researchers and by a BMBF-funded Research Chair for members of a German university (following the AIMS model)<sup>15</sup>. Subject specifications for the

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<sup>15</sup> In this case via DAAD as a complementary model to the AvH (Alexander von Humboldt Foundation) approaches within the AIMS programme or similar funding in DAAD projects: Through the internationally oriented programme "German Research Chairs", financed by funds from the BMBF, seven research chairs have so far been established by the AvH at various AIMS locations. Here, the DAAD provides additional project funds that enable application-

respective chairs depend on the focal points of the participating universities and their content-related concepts. One chair should tend to focus on the field of food systems, the other on data science; connectivity to and interest in the other field would be a decisive selection requirement. The respective chair holder should be provided with additional limited funding, e.g. for smaller research projects that can be implemented by doctoral students and postdocs, among others.

e) Accompanying capacity building measures:

**Holistic qualification programmes** (capacity building workshops) designed to promote academic and non-academic competences will contribute to the success of the participating individual students and researchers as well as to the sustainability of structures and must therefore be considered in both the education and research components as accompanying and integral parts of the programme. This can be realized through training modules that complement the main programme (for example on the topics of academic publishing, leading and moderating research groups, presentation techniques, initiating transfer cycles etc.). These training formats should be made available regionally, which will also strengthen the network aspect of research and transfer. New training formats can be developed for this purpose; in addition, the already existing qualification programmes of the DAAD Centres of African Excellence can be used as well. In this sub-area, own training formats can be developed, but it is also possible to access the already existing qualification programmes of the African Centres of Excellence. In order to ensure regional and continental outreach and to achieve overarching impacts, digital formats on the **digital platform** [www.digiface.org](http://www.digiface.org), which is managed by DAAD as well as by a German and a South African university and which facilitates teaching and research cooperation at the African, European and international levels, are to be considered. The already existing platform could be adapted to the needs of the planned centre (including the integration of research elements and enabling transdisciplinary communication) and expanded accordingly.

f) Transdisciplinarity and practice transfer:

Within the framework of the overall project, a comprehensive concept for **transdisciplinary research** and **practice transfer** as well as for **policy dialogue** is to be developed so that the research results can be incorporated into *Policy papers* and *National development plans* as well as into project plans of local government units and curricula. Among other things, this can be initiated through workshops and various exchange formats with local and regional administrations by involving – for example - the BMEL's departmental research institutes (e.g. Friedrich Loeffler Institute, Johann Heinrich von Thuenen Institute, Julius Kühn Institute, Max Rubner Institute) or other relevant stakeholders.

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related work by the chair holders. Scientists and scholars worldwide conducting application-oriented research and demonstrating expertise in the training of students and doctoral candidates are targeted. As the DAAD selects long-term lecturers worldwide on a large scale and has a broad network of offices and lecturers in Africa, the institution can therefore - if a further increase in the complexity of this multi-institutional project shall be avoided - easily take over the call for proposals and selection of the chair holder directly via the processes of project funding.

## Concluding remarks

The present concept proposal for the planned Centre of Excellence is based on the proven tradition of the successful DAAD funding programme “Centres of African Excellence” and responds with its thematic focus to current needs in Africa. It pursues an innovative transdisciplinary approach and it includes explicitly, in addition to capacity development, for the first time the components of research and stakeholder communication/transfer and transformation processes. In particular, the inclusion of subject-related applied data science met with great interest not only from South African universities, but also from science and agricultural policy stakeholders.

The new Centre of Excellence would use interdepartmental synergies that the Federal Government's "Round Table Africa" had already aimed at from the beginning of the initiative - namely to bring together data, facts, and methodological approaches from different areas in order to use and pool financial resources, specialist expertise and research results more efficiently. This consolidation of expertise corresponds to the concrete needs and interest of the potentially participating higher education institutions, that can thus - for the first time - combine teaching, research, advanced training, and stakeholder inclusion in one funding approach. The planned "African-German Centre for Sustainable and Resilient Food Systems and Applied Agricultural and Food Data Science" could therefore be an innovative pilot, where the gained experiences could be used in the future as a starting point for further inter-ministerial, demand-oriented, and transdisciplinary cooperation projects. In this regard, the DAAD and the institutions already involved will actively explore complementary cooperation opportunities and possible synergies such as application possibilities for the centre within the InRegion/InCountry Scholarship Programme implemented by the DAAD.

### Attachments:

Appendix 1: Results Framework of the new Centre

# Appendix 1: Results Framework

