2. INTRODUCTION

2.1 Importance of the dairy and meat industry for Africa

More than 1.3 billion people currently live on the African continent. The population will almost double by 2050. With the growth and the increasing prosperity of the population, the demand for milk and meat will increase disproportionately[1 2 6]. Consumers in urban centres and with higher incomes will consume significantly more milk and meat products.

Foods of animal origin are already indispensable for local food security in large parts of Africa and represent an important component of a balanced, diversified and healthy diet. They reduce malnutrition and ensure supply for critical population groups, such as infants and adolescents. This can prevent chronic diseases and growth disorders in children (stunting) and can promote their cognitive development[3]. Milk, meat products and eggs are therefore increasingly finding their way into local children's and school nutrition programmes. The average per capita intake of animal protein in African countries is low compared to global standards, at around 15 g of protein per day. With regard to a balanced diet, the positive effects of stabilising and increasing the share of foods of animal origin outweigh the negative effects[3]. Only a few African countries (e.g. South Africa, Tunisia and Morocco) already show a significantly higher consumption of animal products and are increasingly confronted with the consequences of an unbalanced diet (overweight, obesity). This is attributed, among other things, to excessive consumption of animal fats.

Animal husbandry is traditionally rooted across the African continent and forms the economic livelihood of millions of rural households. The proportion of rural households keeping farm animals ranges from 44 % in Nigeria to 79 % in Niger[6]. The possession of farm animals often defines the way and rhythm of life and social status within society. Particularly in regions where arable farming is no longer practicable, pastoral livestock systems are often the most important source of income and food supply and make up a significant contribution to the national meat supply.

Recent studies by the FAO and the World Bank have identified great development potential for the entire dairy and meat sector in Africa[2 5 8]. However, the dairy and meat industry faces major challenges in this respect. Although many of Africa's livestock systems have large stocks, they are characterised by low productivity and low off-take rates. Water scarcity, inadequate cold chain infrastructure, reduced pastures due to the expansion of arable farming and desertification, internal and external conflicts, high import dependency, and unforeseeable weather and environmental events as a result of climate change encounter production systems with low resource efficiency and resilience[3 4 5]. Overall, local production in many African countries is not able to meet the growing demand for dairy and meat products[5]. Rising imports, especially of dairy products and poultry meat, as in West African countries for example, are the result[2].

Thus, the development potential and market opportunities also face considerable weaknesses and risks. The past shows that state intervention and technical projects of multi- and bilateral cooperation are not sufficient for facing these challenges. Private sector investment could bring about substantial added value and effects in many directions (e.g. strengthening local production, improving product quality and safety). So far, these have remained at a low level. The reasons for this are manifold and range from lack of market access, informal market relations and incomplete supply chains and low equity and inadequate funding to insufficiently qualified experts, lack of professional practice, and ineffective systems for monitoring animal health and food safety. In general, entrepreneurial activity in the sector is not sufficiently widespread.

The key question is therefore how private sector involvement in the dairy and meat sector can be stimulated and expanded through better framework conditions and targeted support.

2.2 Need and benefits of private investment

Experience shows that value chains in the dairy and meat industries in developing and emerging countries are particularly successful if they are characterised by a high degree of private-sector commitment and an orientation towards market economy. Private investment is able to generate far-reaching economic impulses which can serve as starting points for the creation of jobs and the economic integration of other players in the value chain.

The importance of private investment in the dairy and meat industry increases particularly with increasing specialisation and processing depth of value chains. The main potential investors are the producers and processors of milk and meat, who, as actors in the value chain, serve the respective raw material and product markets. In addition, investments by relevant suppliers of production equipment and technology as well as specialised service providers are essential to ensure the efficient organisation of the flow of goods from producer to consumer (transport, storage, refrigeration and sales). The production and processing of milk and meat stands in particular for continuous, labour-intensive and location-bound value creation that generates income for the broad rural population and contributes to the prosperity of rural areas in the long term[3] [4] [5]. Private investments not only foster value creation and income, but also strengthen the self-confidence of local producers and consumers in their own economic cycles.

2.3 Commission of the study

This study presents an assessment of the dairy and meat sectors in the six African reform partner countries Ethiopia, Côte d'Ivoire, Ghana, Morocco, Senegal and Tunisia. To this end, the market environment and potential in the value chains of the dairy and meat industries were analysed and the potential for investment and innovation identified. On the basis of seven selected business cases, the study offers practical examples of implementation by concrete investors, which can serve as a basis for interventions along the animal value chains in all countries. In addition, the impact spectrum on sustainable development (17 SDGs) was examined and their consideration in the investment project was elaborated.

At the time the report was drafted, COVID-19 was developing into a global pandemic with far-reaching economic consequences. The report was prepared on the basis of results and findings obtained before and during the preparation period. Thus, a possible impact of the COVID-19 pandemic is not considered. However, it can currently be assumed that COVID-19 will not lead to major changes in local demand or serious disruptions in the flow of goods in the post-pandemic period. In this respect, the authors assume that the main conclusions of the report will remain valid.

2.4 Analysis of the dairy and meat industry and the investment climate in reform partner countries

In order to adequately map the profiles of the milk and meat value chains in the respective countries, the expert team designed standardised questionnaires which were distributed to six local short-term experts as a guideline. The data collection and evaluation were carried out through on-site missions in all six countries, which were completed by February 2020 and led to the preparation of six country-specific studies on the development status and potential of the respective dairy and meat industry.

Despite different political and socio-economic initial conditions, all six reform partner countries have initiated developments that improve the framework conditions for investment. These developments will make it easier to start a business, increase the transparency of corporate taxation and protect private property. Except for Ethiopia, domestic and foreign investors are treated equally in all countries.

Depending on the country, clear consumption and development trends have been identified which reflect the economic development, dietary habits and available natural resources of the respective country.

Tunisia and Morocco already have well-developed value chains for milk and meat, which are supported by a functioning infrastructure of state and parastatal institutions. Poultry meat consumption and milk consumption have already reached high levels, although demand for all products cannot be entirely met by domestic production and is increasingly limited by scarce natural resources (water, feed). In these countries, private investment is recommended, especially in the further processing of dairy and meat products. Furthermore, locations far from the market can be better connected to urban consumption regions through collection points and processing sites.

Ghana, Côte d'Ivoire and Senegal have partly very traditional supply chains with low levels of value addition. At the same time, this group of countries has shown high dynamics in per capita consumption of dairy products and poultry meat in recent years. Many products of animal origin and farm inputs are currently imported. The three countries are pursuing partly different strategies to ensure the supply of dairy and meat products. While the import of dairy products is subject to a common tariff rate in all three countries, the import of poultry meat is regulated by disparate tariff rates and restrictions, thus determining the characteristics of local production. The ECOWAS countries have also joined forces in a regional initiative to improve the competitiveness of local milk production (Offensive Lait).

Compared to the other countries, Ethiopia is in many respects a special case. Here, enormous natural resources and the largest livestock population in Africa meet poverty, malnutrition and strong population growth. The per capita intake of animal proteins is particularly low at 8 g per day. Animal value chains are still dominated by the informal sector and show high losses due to animal diseases and particularly within the supply chains. To address the increasing overexploitation of natural resources, there is official pressure to reduce the number of ruminants, especially cattle. At the same time, the productivity of livestock is to be significantly improved. For livestock, improved breeding and feeding systems and enhanced pasture and animal health management are recommended. In this respect, Ethiopia is showing an extremely strong will to transform and further develop its value chains, but this is being held back by domestic and social conflicts as well as a chronic shortage of foreign currency.

In all countries, there is a risk that the further expansion of milk and meat value chains will lead to additional strain and overuse of natural resources, especially water. The concrete burden must be validated on a case-by-case basis for each spatial zone or investment project. In the six countries, there are already considerable differences in water availability, annual precipitation and the strain on groundwater or other surface waters within the countries.

All countries are striving to improve resource efficiency through sustainable intensification and to avoid overuse of the available resources. At the same time, the aim is to reduce or prevent conflicts between livestock farmers and arable farmers. To this end, a moderate intensification of animal production systems will be pursued. A further contribution can be made by improving animal health and reducing animal and product losses. This requires effective and functioning animal health systems, a high level of qualification of livestock holders and functioning collection systems for raw milk and slaughter animals.

The socio-economic impacts of an investment in the milk and meat value chains are manifold. For example, the positive effects of investing in slaughterhouses outweigh the negative effects if inefficient and unhygienic slaughterhouses are closed at the same time. Tunisia and Côte d'Ivoire have recently carried out studies on their slaughterhouse structure and have called for greater centralisation and the closure of unhygienic facilities. Modernised and privately managed facilities also exhibit significantly higher standards of animal welfare, general hygiene and food safety. This is confirmed by large parts of the population in all countries considered and is supported by corresponding purchasing behaviour.

The six country analyses are attached in chapter 4 and also contain further information and contacts that may be useful for potential investors.

2.5 Business cases as proof of the economic feasibility of potential investments

The seven business cases were developed in the six reform partner countries on the basis of concrete investment projects. The results of the evaluation of the dairy and meat sectors in the six reform partner countries as well as discussions with local investment partners were decisive for the selection of the business cases for the respective country. In particular, local demand trends and the economic prospects in the market segment were considered. Thus, each business case is also a reflection of the respective social and economic developments in the six partner countries. Furthermore, it was considered important to ensure that each selected business case is also of developmental interest and can serve as an example for similar investments in other countries.

The seven business cases are briefly presented below (investment volume).

- **Ethiopia - Integrated feed production and dairy farm with milk collection and processing/Salale Dairy Development Project (EUR 3.9 million)**

In Ethiopia, a strong population growth averaging 2.7 % per year (2011-2018) meets enormous but increasingly scarce natural resources and insufficiently developed animal value chains. In addition, the continuing shortage of foreign exchange is restricting the country's development. Against this background, an investment project was identified 60 km southeast of Addis Ababa, which envisages the establishment of an integrated fodder production and dairy farm with milk collection and processing. Initially, fodder production will be carried out on an area of 510 ha, which will form the basis for the affiliated dairy farm with 400 cows and a target total output of 1,700 tons of milk per year (after 8 years). The own on-sight raw milk production, as well as the complementary milk collection from up to 1,000 small farms also ensure the raw milk deliveries for the affiliated dairy with a processing capacity of 25 tons per day. The total investment volume amounts to around EUR 3.9 million with an equity share of 19 %.

The project will sustainably strengthen existing networks of stakeholders and income effects within the milk value chain by integrating and supporting individually operating milk producers. Project profitability will improve significantly if processing is extended to yoghurt and other dairy products. The investment also offers the opportunity to significantly improve the formal structures and, thus, the urgently needed food safety and product quality in Ethiopia.

Regarding a possible displacement of local small farmers for the planned fodder production area, it should be noted that the investor is a local entrepreneur who has been collecting milk from small farmers for 25 years and is well connected and accepted in the region. In addition, the investor has declared his willingness to expand his already existing economic exchange with the small farmers (sale of basic fodder, purchase of raw milk, job creation).

- **Côte d'Ivoire – Dairy farm with milk collection and processing (EUR 133,000)**

As in many other West African countries, the milk value chain in Côte d'Ivoire, as well as the associated production and food hygiene, is largely not yet established. Rising per-capita consumption here usually meets very basic production systems that are far from being able to guarantee the country's supply. Therefore, a business case has been identified near the city of Tiassalé, 120 km northeast of Abidjan, which is dedicated to expanding the milk value chain in this region. The investor is a farmer who already owns a herd of 20 cows and is closely linked to the local livestock farmers' cooperative.

With an investment volume of EUR 133,000, a dairy farm with integrated heifer rearing and own fodder production, as well as a milk collection and processing plant with a capacity of 142.5 tons per year can be built.

The investment will significantly increase the share of regional value addition in milk production through high-quality milk, while, at the same time, promoting knowledge transfer and networking among the small farmers involved. The investment will create up to 18 skilled jobs in the production and processing sectors.

- **Côte d'Ivoire – Cattle abattoir (EUR 4.3 million)**

Despite a well-developed traditional livestock sector, Côte d'Ivoire has inadequate processing and supply facilities for red meat. In this context, the construction of a new cattle abattoir near Bouaké, the country's second largest city, has been identified as a potential business case in Côte d'Ivoire. In the long term, the abattoir aims to achieve a slaughter capacity of up to 300 cattle and up to 40 small ruminants per day.

The new abattoir outside the city has been in the planning stage for years, including discussions with the World Bank and the AFD (*Agence Française de Développement*), but so far without result. One obstacle has always been the negotiations on land ownership with the adjacent village of the new site, which have now been resolved. The new facility is on the Ministry's (MIRAH) priority list, which includes the construction or renovation of several abattoirs in the larger towns of Côte d'Ivoire.

The project represents an investment of €4.3 million.

The construction of the new abattoir will significantly improve the formal processing structure and thus slaughter conditions. The resulting increase in productivity and hygiene standards for animal foodstuffs will not only lead to improved working conditions and a higher level of health protection for workers, but also to substantial changes in food safety, consumer confidence and animal welfare.

- **Ghana – Poultry abattoir (EUR 6.1 million)**

In view of the disproportionate growth in poultry meat imports in recent years (2014 to 2018: +187 %), an existing proposal by a local processor for an investment project was taken up in Ghana. The project involves the expansion of an established, private abattoir in the capital of Accra with a poultry slaughter line and modernisation of the technical equipment. At peak times, 10,000 locally produced chickens per day will be slaughtered and processed in addition to 825 heads of cattle (per day).

The modernisation and expansion of the facility will require a total of EUR 3.6 million in the first year of the investment project and a further EUR 2.5 million in the third year.

The investment has a good chance to stimulate local poultry meat production and processing. In doing so, it will sustainably increase the value addition in the country by creating a lasting local demand from the processing industry and by expanding formal processing structures for animal products. In addition, the food and consumer safety of local production will be significantly increased through improved and more hygienic work processes and procedures, while at the same time, up to 15 higher quality jobs will be created in the slaughterhouse alone. Moreover, considerable job and income effects can be expected in the upstream and downstream industries of the value chain (broiler fattening with feed supply, distribution and retail of chilled broiler meat).

- **Morocco – Goat cheese dairy (EUR 343,000)**

Similar to Tunisia, the identified investment project in Morocco ties in with the local dairy value chain. In the Tangier region, a goat cheese dairy is to be built, which will be based on the collection and processing of locally produced goat milk from the surrounding livestock keepers. The investor is an active member of the local goat farmers' association ANOC, maintains an own goat herd of currently 50 animals himself and runs a typical small farm with 7 hectares of arable land. Motivated, as well as logistically and administratively supported by ANOC, the investor intends to become involved in the processing of goat milk and to integrate another 20 neighbouring goat farmers into the value chain. The aim is to sell 44 tonnes of cheese products per year, mainly in the surrounding and well-developed gastronomy and tourism sector. For the expansion of the goat cheese dairy 343,000 EUR are estimated, of which 200,000 EUR would have to be financed externally.

The project will mainly support the network of local producers through resource-efficient goat farming with high environmental compatibility, creating up to 30 new jobs in primary production and processing in rural areas. In addition, if the results are encouraging, the investment will allow the expansion and integration of additional livestock farmers.

- **Senegal – Dairy farm with milk collection and processing (EUR 432,000)**

As compared to other West African countries, Senegal already has a more developed dairy cattle sector and shows a significantly higher per capita consumption and a higher degree of self-sufficiency. Traditional animal husbandry combined with a strong local entrepreneurial spirit ensures that the country holds a self-sufficiency ration in milk and dairy products of over 50 %. The identified business case of a dairy farm with milk collection and processing, 100 km northeast of Dakar, builds and expands on already established structures. Four brothers (two farmers, a veterinarian and a veterinary technician) already own a herd of 38 cows and are currently producing milk for the local market.

With an investment sum of EUR 432,000, with an equity share of 21 %, the dairy farm is to exploit its production potential by expanding its livestock to initially 100 and in the future to 200 cows while simultaneously expanding milk collection and processing.

With the production of higher processed dairy products such as yoghurt, cheese and pasteurised milk, the local processing industry also has the opportunity to position itself for the future. In the course of the investment, 16 permanent and 21 seasonal jobs will be created. Furthermore, the investment strengthens the economic integration of the approximately 100 small farmers in the area and thus the future competitiveness of a local production site.

- **Tunisia – Dairy farm with cheese dairy (EUR 440,000)**

Against the background of a well-developed market and a high per capita consumption of milk and dairy products in Tunisia, a possible investment in a dairy farm with an attached cheese dairy was identified in the Kasserine region. In the milk production sector, the project includes the construction of a dairy farm with 100 cows, heifer rearing and integrated fodder production on an area of 35 ha. Furthermore, the extension of existing milk collection and the construction of a cheese production plant are planned. The cheese production will be expanded to 600 tons per year within five years. The supply of high-quality milk required for this purpose will be ensured by the existing milk collection and supplemented by the company's own milk production.

For the investment, a total of EUR 440,000 is required, with 30 % of the investment sum being provided from equity capital, while the remaining 70 % is to be financed by a bank loan. The investment will allow the creation of up to 20 technically demanding jobs on the farm, which will be generated in a rural region far from the market. As suppliers of raw materials, smaller milk producers in the vicinity of the farm also benefit, as they have few alternative sources of income in this semi-arid location. The region is characterised by low precipitation and is particularly dependent on sufficient availability of water for irrigating the forage crops. Even if the investor carries out the water extraction in agreement with the local water authority, there are risks of overuse, which should be minimised by water-saving measures (selection of seeds, irrigation technology and fodder production methods).

Conclusions

The results of the seven business cases show that investments along animal value chains are possible and economically promising from the point of view of investors and generate additional value creation in upstream and downstream industries. The business cases also demonstrate the willingness of local investors to take responsibility for their companies and the players in their economic networks. There are willing and competent investors at all stages of the value chain, from the provision of inputs such as animal feed to the actual primary production of raw milk and product refinement.

The business cases also show that private sector investment across a broad spectrum has an impact on sustainable development objectives. The most important of them are SDG 1 (No Poverty), SDG 2 (No Hunger), SDG 3 (Good Health and Well-Being including One-Health) and SDG 8 (Decent Work and Economic Growth). In addition, positive effects on SDG 5 (Gender Equality) and SDG 10 (Reduced Inequality) can also be observed. Particular attention should be paid to SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action) and SDG 15 (Life on Land). Except for the two investments into abattoirs, all business cases are realised in rural areas. Even in these two business cases, raw materials are supplied by small farmers from rural areas. In this respect, all business cases have a rural impact and open up additional economic opportunities.

However, animal production is criticised in particular for its land consumption and emissions. Therefore, an environmentally and climate-friendly approach to animal husbandry systems should be an essential component of a sustainable development strategy for the dairy and meat industry. The aim is to reduce losses and the production of waste or to recycle it through improved resource efficiency at all stages of the value chain. With regard to climate compatibility, the investments should both contribute to a reduction of GHG emissions per kg of milk and meat and not further increase the total emissions of climate-damaging substances in the respective region/country.

With regard to SDG 6 (Clean Water and Sanitation), there is no shortage of water for the business cases in Code d'Ivoire, Senegal, Ethiopia and Ghana, as there is sufficient rainfall during the year, at least during the seasonal rainy seasons. In the business cases of Morocco and Tunisia, the topic of use of water resources was taken up and discussed with the respective investors. It became clear that the risk of conflicts of use or overuse by the investors was not shared in all cases (TUN). We have additionally included this aspect in the SWOT analysis for each business case in order to identify and assess the risk. A sustainable approach also includes compliance with animal welfare standards in animal husbandry, transport and slaughter.

The seven business cases are attached (chapter 5) and contain further information on the contact persons and contacts who contributed to the preparation of the business cases.

2.6 Investments in the dairy and meat industry as a contribution to achieving ambitious development goals

- **Instruments to promote private sector investment in the dairy sector and meat industry**

The instruments should be differentiated according to the target groups "livestock holders" and "investors in the provision of production equipment and technology and the processing of animal products".

Livestock holders should be supported by specific support programmes which, at the request of the livestock farmer, trigger targeted investments in modernisation and in climate- and environmentally friendly animal husbandry. In the programmes, the respective target group of livestock keepers should be precisely defined and linked to certain criteria, such as the number of animals and the availability of agricultural land. The amount of investment per livestock holder is usually set below € 100,000. In individual cases, however, larger investment sums may be required for new livestock farms with larger numbers of animals. Depending on the type of investment, support could consist of a grant and low-interest financing. To this end, KfW, for example, could work closely with local banks in the reform partner countries to develop appropriate solutions for financing.

Investments in the provision of production equipment and technology, and in the processing of animal products may vary. Typical examples are investments in feed mills, hatcheries and insemination stations, private veterinary services, service facilities for milking and husbandry technology as well as slaughterhouses, butcheries, and dairies, including downstream distribution facilities for milk and meat products. Investment sums between €100,000 and €5 million per project are expected. Here, the main instrument required is sector-specific investment financing, which could be developed jointly between German development banks and local banks. Financing concepts should take into account the long-term horizon of investments in this sector. European companies could also make use of the investment financing instrument of AfricaConnect as part of the BMZ Development Investment Fund, which is issued through DEG (Deutsche Investitions- und Enwicklungsgesellschaft). Investments in the reform partner countries are specifically promoted and facilitated through needs-based, unbureaucratic financing offers. African companies that already have a long-term business relationship with a European company are also promoted. Support could be provided through the Africa Business Network, which combines advisory and support services of foreign trade promotion and development cooperation. Another instrument would be the AfricaGrow Fund, which is designed to meet the financial needs of SMEs and technology start-ups.

Few European investors are likely to be able to set up integrated projects from feed production to animal husbandry and processing on their own. Cooperation between stakeholders and the identification of local initiatives with which to network are therefore particularly important. Organisations such as the German Agribusiness Alliance or the AWE (Agentur für Wirtschaft & Entwicklung) can help support the exchange of information and coordination between the actors.

Tailor-made business support services should flank private sector investment. These include advising and training investors in business management, qualifying specialists in technical and management-related areas and in the introduction of control systems for hygiene, traceability and quality of dairy and meat products. Both internal and cross-company advisory, information and control systems in the respective value chain should be included in the support if they contribute to the stability of the investment project. The develoPPP programme of the Gesellschaft für Internationale Zusammenarbeit (GIZ) and the supporting network activities (AWE, Afrikaverein, EZ-Scouts etc.) could be used here.

- **Creating the right framework conditions as a prerequisite for private investment**

The above investments are effective and successful if they are supported by a coherent sector policy, the combined development of appropriate infrastructure, and the creation of appropriate market conditions. Financial cooperation measures play an important complementary role to technical cooperation measures and public-private partnerships. The global project Fund for Agricultural Policy Advice and Innovation (FABI) could support decision-makers in the reform partner countries in developing and implementing the relevant agricultural and trade policy strategies. This includes the preparation of instruments to promote private sector investment and conditions in the areas of the environment, climate and animal welfare, advice on trade policy issues such as setting import conditions for milk and meat and clarifying the conditions for international market access. Cooperation with the GIZ sectoral project "Agricultural trade, promotion of the agricultural economy and agricultural financing" could also be helpful here.

Selected instruments should be combined in a comprehensive development strategy for the dairy and meat sector. Depending on the development of demand, it is necessary for market players and commodity flows in the value chain to be analysed and relevant objectives to be derived from this. The aim should be to strike a balance between import conditions, promotional approaches for domestic production and legal requirements for the health of skilled workers and animals and the safety and quality of animal foodstuffs.

In this context, complementary public investment is needed to ensure sufficient availability of skilled labour, the application of good professional practice and safety and quality at all stages of the value chain to meet market and consumer expectations. Support could be provided through appropriate technical cooperation projects in the following areas:

- Introduction of specialised initial and further training courses for skilled workers in the dairy and meat industry (livestock holders, milkers, livestock traders, dairy and meat traders, feeding and production advisors, insemination technicians, dairy experts, butchers). In this context, it is possible to draw on the many years of experience and the high professional level of initial and further training institutions in Germany. Examples include the Institute for Reproduction of Farm Animals Schönow e.V. for the qualification of insemination technicians, the Dairy College Kempten for the training of milk technologists and the Academy for Public Health in Düsseldorf for the further training of food inspectors.
- Design and implementation of monitoring systems for animal health, traceability, food safety, control of residues and antibiotics and health assessment of food professionals

Technical cooperation projects should be embedded in the long-term development strategy for the dairy and meat industries in the partner countries and be based on the guidelines of international organisations such as WHO, OIE, the Codex Alimentarius and the One-Health approach. In this context, nutritional advice and information could also become an integral part of technical cooperation and contribute to balanced, diversified and healthy nutritional development. Here, networking with the GIZ global project "Food security and resilience strengthening" would be useful. Alternative foods (insect proteins, in-vitro meat) are not yet of economic importance for the short- and medium-term supply of the population with high-quality proteins in Africa and could currently be promoted through research cooperation.

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