African Dairy Genetic Gains

Building the Business Case

October 8-9, 2018 • Nairobi, Kenya

The **African Dairy Genetic Gains** (**ADGG**) is a four-year multi-partner, multi-country project that began operation in November 2015 with an investment of over **9.2 million dollars** by the **Bill & Melinda Gates Foundation** (**BMGF**) and is being implemented by the **International Livestock Research Institute** (**ILRI**) in close co-operation with partners in **Ethiopia** and **Tanzania**. ADGG is a pioneering project aimed at developing and testing genetic gains platform that uses on-farm performance information and basic genomic data for identifying and proving superior crossbred bulls for Artificial Insemination (AI) delivery and planned natural mating for the benefit of smallholder farmers in Africa.

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INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
IFPRI

ADGG
African Dairy Genetic Gains
More productive and profitable dairy cows

CGIAR
RESEARCH PROGRAM ON Livestock

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

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Executive Summary

A workshop on African Dairy Genetic Gains (ADGG), held on 8-9 October, 2018 in Nairobi provided a useful opportunity to exchange views on the performance of current programs on ADGG and the future directions. The following provides a summary of the leading issues that workshop participants considered as key messages and guidance for the furure.

1 **Technological innovations**: Improving the smallholder dairy value chain demands a significant body of research on the development and delivery of genetics innovations, feed availability and affordability, and animal hygiene and health.

2 **Trust** is key to the success of dairy genetic gains. This is predicated on the realization that farmers drive genetic gains, and getting reliable information from farmers is key. ADGG deals with farming communities who expect a two way exchange of providing data and receiving feedback. It is imperative that ADGG continue the task of building farmers' trust through awareness creation using high quality and timely information backed by innovative methods of communication.

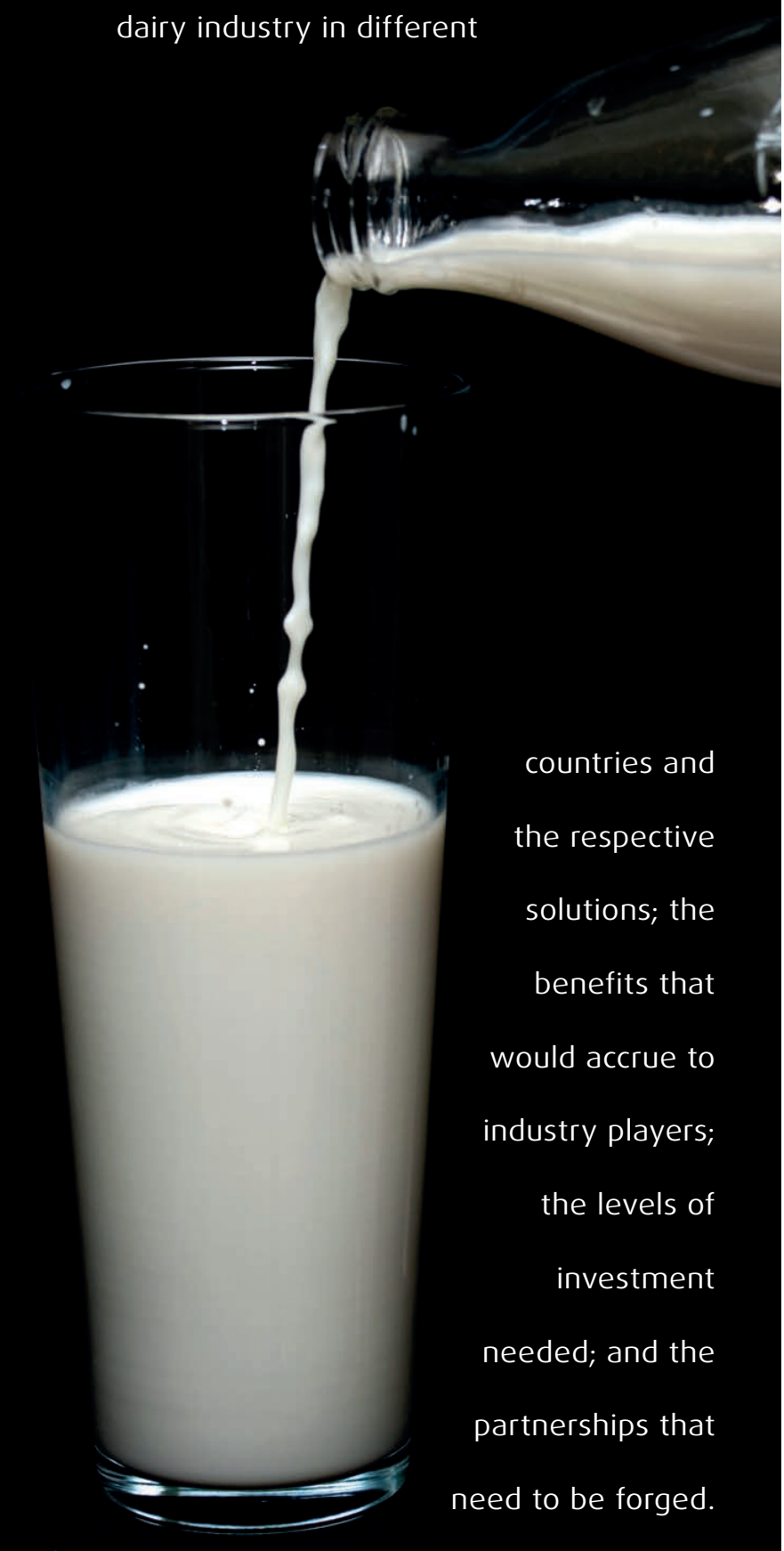
3 Recognize the critical role that **private sector** companies play in genetic service delivery. The rich experience of PAID in using private sector agencies in the delivery of AI services is a case in point. Innovations in delivery—including use of drones to deliver AI straws—can be hastened through a credible engagement of the private sector. Indeed, of involvement of the private sector in such services as AI provision is a sign of replicability and sustainability.

4 **Multiple interventions** are a necessary. Getting the genetics right is a necessary, but not a sufficient condition for dairy-based agricultural transformation. It is, therefore, essential that a value chain approach—more akin to a programme perspective—be pursued to exploit the substantial market opportunities that currently exist for dairy and dairy products. In so doing, the programme components that would complement genetics innovations as well as the partners who would be better suited at leading them need to be carefully identified.

5 **Organisational innovations**: Arrangements that would promote collective action are central to upscaling dairy genetic gains, pursuing a value chain approach and ensuring sustainability. These arrangements should allow for the engagement of partners that have a clear and measurable stake in the dairy value chain. In this respect, multi-stakeholder dairy platforms of various forms have proved their worth in facilitating collective action.

6 **Government engagement**: Supportive government policies and administrative structures play significant roles in improving the structure and performance of the dairy value chain in Africa. Experience has shown that, in addition to involving technical Ministries, there is a need to engage local government authorities (LGAs) for the ADGG initiative to be meaningfully integrated into government systems and thereby ensure its sustainability. In light of the importance being given in much of Africa to decentralisation and devolved administration, devising mechanisms that help forge partnerships would prove to be critical going forward.

Building the dairy **business case** necessitates a clearer understanding of the key bottlenecks affecting the dairy industry in different countries and the respective solutions; the benefits that would accrue to industry players; the levels of investment needed; and the partnerships that need to be forged.



7 **R&D** agenda needs to be tailored to meet the demands of farmers and the market. The technical research agenda (e.g. genetic gains) should respond to all clients. Exploring a policy research agenda that would address the needs and priorities of all actors is also required.

8 **Competitiveness** is key for success. Incentives and profits across all value chain actors are critical. To this end, it is necessary that the dairy value chain be upgraded to optimise benefits for all. Beneficiaries from enhanced dairy productivity and from streamlined marketing arrangements will be made, using existing methodologies. In addition to economic analysis, competitiveness demands use of geo-spatial analytic methods so as to devise spatially-differentiated strategies for market opportunities.

9 Building the dairy **business case** necessitates a clearer understanding of the key bottlenecks affecting the dairy industry in different countries and the respective solutions; the benefits that would accrue to industry players; the levels of investment needed; and the partnerships that need to be forged.

10 **Communications** are key at all levels: communicating what works using a range of media (e.g. radio, TV, smart phones) tailored to the needs and capacities of the target audience should be a continual engagement. Use of **ICT platforms**, is critical not just for message transmission but also for supporting data (genetic and economic) analytics. Demonstrations and farmer-to-farmer interaction, remain important avenues for taking innovations to scale among smallholder dairy producers.

Box 1. Summary of participants' views on current and future focus areas of ADGG

High Priority	For the Future	To Stop/Slow
Show outcomes from the farmers perspective based on collected data. This should then be shared with like-minded early adopters with a view to invest in 'part of whole' in the ADGG platform in the respective countries	Collect more data on the outcomes at farm level-related production, performance data with household consumption of milk and other dairy products	Not to dilute animal genetic resources
Diversify value propositions to farmers—consider farmer incentives for sustainability through best management practices, better farmer recordings, skilled extension agents and DPRCs	Alternative methods to AI developed and shared with farmers—researching on what is better than LN_2	
Improve farmers knowledge on: 1) Feeds—quality and quantity 2) Animal health, disease control/prevention, 3) Market—Farming as a business, 4) Technology and 5) Heat detection	Providing an appropriate platform to evaluate exotic genetics for use in Africa through analysis of data across the countries. Ensure adequate, accurate and reliability of results	Scaling to other countries before key bottlenecks are addressed
Assessment of ADGG impacts on socio-economic indicators in Tanzania/Ethiopia using all the data collected from farmers (iCow)	ADGG should measure milk chemical composition and feeding. In addition, the support should not only be on genetic gain but also in providing suitable environment for the improved breeds	Intervening at cooperative societies level—unfocused information
1) Farmer training including business knowledge, 2) Reverse data flows i.e. sending back customized information to farmers 3) Feed and Fodder availability—driven by markers and farmer knowledge 4) Government policy—aligned government plans and continuity to ensure stability and growth	A block-chain based cow identification and farm management (and AI information system)—Artificial intelligence for Artificial Insemination	Reconsider large breed promotion
Improved capacity building for AI technicians and electronic performance, data capture and feedback systems	Design and implement 'Dairy Business Hubs' that should take over the primary level data capture and provide services such as availing market awareness for different product lines	Focusing only on farmers with exotic breeds/crossbreeds
Data Capture—focus on improving the ODK system which enables sharing data and feedback systems	Adopting proven technology in advancing dairy business (semen and embryo transfer technologies)	Viewing ADGG as solution to all issues rather than viewing ADGG as a source of information and knowledge
Share information and knowledge with key policy makers in respective countries to create a sense of urgency for action by both public and private stakeholders	Building on iCow experiences on extension support and advisory services delivery	Not to over rely on farmers-reported data. There should be independent mechanisms to verify farmers' claims and improve data accuracy
Developing stakeholder ecosystem map for larger value chains	Integrated approach focusing on technical and institutional policy improvement of the dairy industry inclusive of breed improvement, feeds supply, market development etc. in collaboration with stakeholders	
Strengthening the AI Service delivery—reviewing the whole process e.g. infrastructure of semen centers, to the actual delivery of the service	Improved communication within countries—better information sharing platforms	
Comprehensive training of both farmers and extension agents. Incentives for AI technicians e.g. better incentives for AIs with high success rates	Partnerships—engage stakeholders across the value chain who are willing to demonstrate right practices e.g. Partnering with feeds companies that produce the right quality of feeds at the right price—adopt a unifying and practical commercial approach	
Policy reforms (Advocacy)—establishing small-holder dairy platforms at local, regional and national levels		

I. Background

1 A workshop on '***Building the Business Case for African Dairy Genetic Gains*** (***ADGG***)', jointly organised by the ADGG project of the International Livestock Research Institute (ILRI) and the Scientific and Technical Partnerships in Africa Programme of the International Food Policy Research Institute (IFPRI) was held on 8 and 9 October 2018 at Windsor Hotel, Nairobi, Kenya.

2 ADGG is a four-year multi-partner, multi-country project that began operation in November 2015 with an investment of approximately USD 10 million dollars by the Bill & Melinda Gates Foundation (BMGF) and is being implemented by ILRI in close co-operation with partners in Ethiopia and Tanzania. ADGG is a pioneering project aimed at developing and testing a genetic gains platform that uses on-farm performance information and basic genomic data for identifying and proving superior crossbred bulls for Artificial Insemination (AI) delivery and planned natural mating for the benefit of smallholder farmers in Africa.

3 In Ethiopia and Tanzania, local cows only produce an average of 2.3 liters per day of milk, compared to more than 12 liters a day with improved crossbreeds. ADGG has been established to address this yield gap: Improved dairy productivity is the cornerstone of ADGG.

4 In his opening remarks, **Dieter Schillinger**, **ILRI's Deputy Director General of Research and Development—Bio-Sciences**, appreciated the timeliness of organising a deliberation on a business case for ADGG where feasible approaches to critical challenges affecting the dairy industry would be discussed and a convincing value proposition for improving the industry identified. He also brought to the attention of participants recent developments concerning gene editing and the implications this would have on the types of research ILRI undertakes.

5 **Kerri Wright Platais** (**IFPRI**) outlined the main objectives of the workshop as follows:

- **a** Take stock of critical research outcomes from ADGG to ***ensure market readiness*** along the dairy value chain in Ethiopia and Tanzania;
- **b** Describe and discuss the supply chain and its bottlenecks for the ***Dairy Business Case***;
- **c** Explore options for ***achieving impact at scale*** with the existing agricultural technologies; and
- **d** Discuss broad outlines of the ***Development Outcomes*** of ADGG and the partnerships that need to be forged.

6 The Meeting was attended by a total of 38 participants including the following institutions: partner government agencies from Ethiopia and Tanzania involving agricultural ministries, local government departments, agricultural research institutes and universities; private sector actors; ILRI; IFPRI; Public-Private Partnership for Artificial Insemination Delivery (PAID); Land O'Lakes, Inc.

7 A panel discussion session dedicated to private sector actors highlighted key bottlenecks that need to be unlocked to enhance the effective participation of the private sector in the dairy value chain. Two breakout sessions were organised: On Day 1 participants were grouped into Country Teams (Ethiopia and Tanzania) to discuss the current state of the dairy industry in the respective countries and measures that need to be taken to improve the performance of the industry and enhance the development effectiveness of diary-oriented interventions; On Day 2, four groups were formed to discuss mechanisms of making key production inputs accessible and affordable.

II. Updates on Progress with ADGG and PAID

8 Introductory remarks by **Steve Kemp**, **Leader of ILRI's Livestock Genetics Programme** (**LiveGene**) and **Malcom Hatley**, **Programme Leader of PAID** focused on the importance of bringing new partners to the fold and listening to the views of the private sector concerning the transformation of the dairy system and on the PAID-ADGG partnership, giving particular attention to the key achievements of PAID.

9 **Okeyo Mwai**, **ADGG Project Leader**, **ILRI**, provided a brief account of the challenges ADGG set out to address, the objectives it aims to achieve, the performance of ADGG to-date and the challenges encountered in the process, and, finally, the future focus of ADGG, pursuing an approach that is anchored on innovative application of existing and emerging ICT and genomic technologies, ADGG has the following objectives: (i) to establish National Dairy Performance Recording Centres (DPRCs) for herd and cow data collection, synthesis, genetic evaluation and timely farmer-feedbacks; (ii) to develop and pilot an ICT platform to capture herd, cow level and other related data and link it to DPRCs; and (iii) to develop low density genomic chip for breed composition determination and related bull certification systems for crossbred bulls.

10 ADGG has registered over 56,000 farmers and 94,000 animals and established proof of the value of digital farmer education. Strengthening the ICT platform through improving data quality and building partnerships were cited as among the key areas of emphasis in the future.

11 Country team presentations from Ethiopia (by **Besufekad Jufar** and **Zelalem Yilma**) and Tanzania (by **Eliamoni Lyatuu** and **Malcom Hatley**) and extensive plenary-level discussions enabled participants to appreciate the achievements, current status, challenges and measures taken with respect to the ADGG and PAID programs.

12 It was reported that, in Ethiopia, implementation has focused on enhancing the data recording and processing capacity of the National Artificial Insemination Centre (NAIC), now National Animal Genetic Improvement Institute (NAGII). Moreover, a range of items required for field data collection were procured and distributed using finance from different sources. Operating in the four major regions of the country, ADGG and PAID registered 7,433 farms, 21,726 animals and collected hair samples from approximately 5,094 cows. In the same vein, in Tanzania, ADGG and PAID have been operational in five regions in which a total of 25,741 farmers are registered and 54,287 animals being monitored, of which 11,226 have milk records and hair samples collected from approximately 6,000 cows.

13 In Ethiopia, AI service provision is heavily subsidised (about 10 per cent of what the private sector charges) and is being largely promoted on the back of the public extension system. While in Tanzania, AI service provision is largely done through the private sector charging the market rate (i.e., USD 10/AI).

14 In both countries, significant work was done to enhance human capacity through technical training for AI technicians and training of farmers. The later has been buttressed through preparation of training materials along the dairy value chain employing different mechanisms and using local languages. Another major body of work undertaken in both countries is 'animal identification' whereby blank ear tags are made available to AI technicians for the purpose.

African Dairy Genetic Gains

More than
56,000
farmers registered

More than
94,000
animals registered

More than
5,094
hair samples collected in Ethiopia

More than
6,000
hair samples collected in Tanzania

In Tanzania, cost of only
10 USD
per insemination

ADGG/PAID is monitoring
11,226
cows with milk records in Tanzania

Data accurate to October 2018

In both countries, the main challenges encountered centred on shortage of liquid nitrogen (LN_2), acquisition of reliable data and timely data recording.

15 The Livestock Master Plans of both Ethiopia and Tanzania provide long-term strategic directions for livestock development, serve as foundations for the improvement of the dairy industry and are instrumental in moving forward the ADGG initiative. In both countries, the main challenges encountered centred on shortage of liquid nitrogen (LN_2), acquisition of reliable data and timely data recording. In Ethiopia, logistical issues largely to do with poor internet network and server functionality also negatively impacted on progress with ACGG and PAID operations. In Tanzania, at least 24 local government authorities (LGAs) set aside budget for continuation of activities initiated by ADGG within their respective geographic territories, including updating of regulations in support of data capture and monitoring.

16 As regards future courses of action, the following were considered as key priorities: awareness creation among farmers on the importance of dairy performance recording; building the capacity of field staff to deliver quality services including AI service efficiency; emphasis on 'animal identification' as a prerequisite for tablet-based performance data tracking and feedback; winning the confidence of farmers for services delivered; improve performance data flow from the field; engage more private dairy farms/AI technicians (Ethiopia); pilot use of hormones for heat synchronisation; and establishment of strong data analytics team. In this later respect, suggestions were made to put in place a shared data, communication and language teams across ACGG and ADGG programs.

17 The informative panel discussion involving key ADGG partners (e.g. government representatives, private sector operators and representatives of collaborating academic institutions) from Ethiopia (**Amhara Regional Bureau of Agriculture and Ethiopian Milk Processors' Industry Association**), Tanzania (**Tanzanian Livestock Research Institute—TALIRI**, **private farmers and consultants**) and **Sokoine University of Agriculture**) and Kenya (**BIDCO—Land O'Lakes**) highlighted several issues that needed to be taken into consideration. The chief ones revolved around the following: recognition that use of mobile applications has been making impact on data generation on dairy genetics; the need for strengthening the capacity of farmers to participate in the data collection process as well as in the provision of feedback; the importance of forging partnerships with local universities, vocational training centres, professional associations, cooperative unions and diary associations; the need for tailoring interventions to support diary value chain actors, taking into account government livestock master plans/strategies; establish smart subsidies for livestock inputs, including AI service provision at milk sale points; and publicise successful AI provision experiences and related interventions to recruit yet more farmers into the dairy genetics initiatives.

The Livestock Master Plans of both Ethiopia and Tanzania provide long-term strategic directions for livestock development, serve as foundations for the improvement of the dairy industry and are instrumental in moving forward the ADGG initiative.

Furthermore, it was noted that, issues around housing hygiene, animal health, improved feeding, and use of AI were among the most implemented messages received by farmers using iCow's platform.

18 A presentation on iCow (**Su Kahumbu Stephanou** from **Green Dreams Technology**) elucidated the partnership with ADGG and PAID by underlining its role as a provider of verified valuable agricultural content to farming communities embraced by the project. It was reported that, to-date, iCow has reached a total of 35,701 farmers (of whom 57 percent are from Tanzania and 43% from Ethiopia) through delivering over 5.7 million farmer education messages sent by SMS in their respective language of choice. The content that iCow delivers—with a focus on dairy cows—were found both useful and implementable. Furthermore, it was noted that issues around housing, hygiene, animal health, improved feeding, and use of AI were among the most implemented messages received by farmers using iCow's platform. An interesting feature of the SMS service is that over 60 per cent of those receiving the messages reported to have shared the messages with others not registered under the iCow platform.

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19 Based on experiences from Kenya, where the iCow platform has been in use extensively, seven sets of recommendations were suggested: (i) increase value to users – i.e., diversify product and content offering; (ii) expand geographical territories; (iii) provide iCow services to farmers outside of ADGG; (iv) adopt mobile e-extension, move away from insistence on 'boots on the ground'; (v) partner with national telecommunication agencies to enable cost-effective scaling; (vi) expand partnerships and embrace players/programmes to leverage scale; and (vii) explore potential revenue streams, including institution of flexible payment and delivery models, monthly subscriptions, and SMS bundles[1]. Expansion of partnerships and achievement of sustainability, scale and efficiency investment in mobile technology are key consideration for impact.

iCow reached more than
35,701
farmers registered

More than
5.7m
farmer education messages sent

[1]*It was reported that bulk purchase can reduce cost to USD0.0015, from the current USD0.054.*

III. Impact Pathways and Ecosystem Maps

20 Building on the updates given by country teams, **Katharine Downie** (**World Vision**) and **Eliamoni Lyatuu** (**ADGG – Tanzania**) made a conceptual, forward-looking joint presentation on ***dairy supply and value chains*** as well as the likely ***Impact Pathways*** that ADGG should consider adopting. The main point of departure of the presentation was the realisation that ADGG current focus on farm level outcomes and the emphasis it places on greater productivity from genetically improved dairy cows has to expand. Indeed, it was noted that commercialisation of small dairy producers will engender greater complexity to the diary value chains, hence the need for taking into consideration consumers' preferences and market opportunities. This, it was underlined, needs to be informed by an understanding of the myriad actors in the larger diary value chain as well as an examination of the additional processes and outcomes that should be targeted.

21 The presentation specified 'increased genetic gains of dairy animals', 'increased productivity of dairy animals' and 'increased income of dairy households' as key result areas, showed a roadmap to achieve the three objectives (so-called 'results pathways') and identified a host of 'influencing factors' categorised into three groups: genetic gains from improved AI owing to production systems (including access to inputs) and husbandry practices; support to livestock genetic improvement from local, national and international research and development systems; and the role of regulatory frameworks in support of upscaling livestock feed, genetics and health. (See Figure 1 for a schematic presentation of an abridged version of 'Results Pathways and Influencing Factors'.)

22 Central to a clearer understanding of ***Results Pathways*** is identification of actors and stakeholders in the various different value chains. To this end, 'ecosystems maps' was identified as a useful tool of planning, monitoring and identifying strategic partnerships in value chain analysis. (Figure 2 provides an example of a dairy sector ecosystem for Tanzania).

23 A well-structured ecosystem map provides a good basis for identifying the appropriate supply chains, which in turn is critical to tracking product quantities as they flow between actors. Value chains also help track production costs at each stage in the supply chain.

Box 2: Ethiopia—Summary of Results of the Group Discussion Session

Market analysis:
- Cooperatives to embrace a bottom-up business model
- Embrace quality-based dairy payment system—raise farmers' awareness
- Establish systems to transition informal dairy operations into the formal sector
- Undertake spatial and temporal demand analyses—with emphasis on nurturing demand

Farm technology:
- Develop the feed industry
- Cooling tanks for collective action
- Promote biogas digester
- Support technology development: e.g. hydroponic farming.
- Technological options to reduce calf mortality as well as post-harvest losses

Partnerships:
- Cultivate and coordinate partnerships among farmers, service providers (e.g. traders, R& D agencies, traders, manufacturers, consumers, and policy makers
- Establish 'Dairy Board'

Development outcomes:
- Enhanced dairy value chain
- Improved household nutrition
- Import substitution
- Income and economic development

24 On the bases of the presentations made and the discussions that ensued, significant time was devoted to country-based group discussions with the view to developing respective country action plans using the following as points of reference: market analysis, farm technology, partnerships and development outcomes. Boxes 1 (Ethiopia) and 2 (Tanzania) provide a summary of the results of these group discussions.

25 As can be gathered from the above, the group discussions arrived at context-specific suggestions through employing a uniform set of parameters. Moreover, in both countries a range of broadly similar suggestions were also forwarded.

Box 3: Tanzania—Summary of Results of the Group Discussion Session

Market analysis:
- Facilitate willingness to pay for improved animals based on breeding value
- Study on viability of milk quality-based payments
- Learn from viable models of smallholder commercial dairy
- Reduce regulatory barriers (e.g. those affecting milk processing)
- Address knowledge gaps concerning price analysis

Farm technology:
- Address gaps in dairy technology skills and agribusiness
- Enhance awareness of farmers on, among others, milk quality at farm level
- Increased investment in liquid nitrogen (LN_2)

Partnerships:
- Establish SAGCOT catalytic fund for PPPs
- Strengthen Dairy Development Forum
- Support EADD-type value chain development initiatives

Development outcomes:
- Higher consumption of milk per capita
- Improved access to credit facilities to small-scale operators
- Establish model dairy farmers as hubs for smallholders

Results Pathways

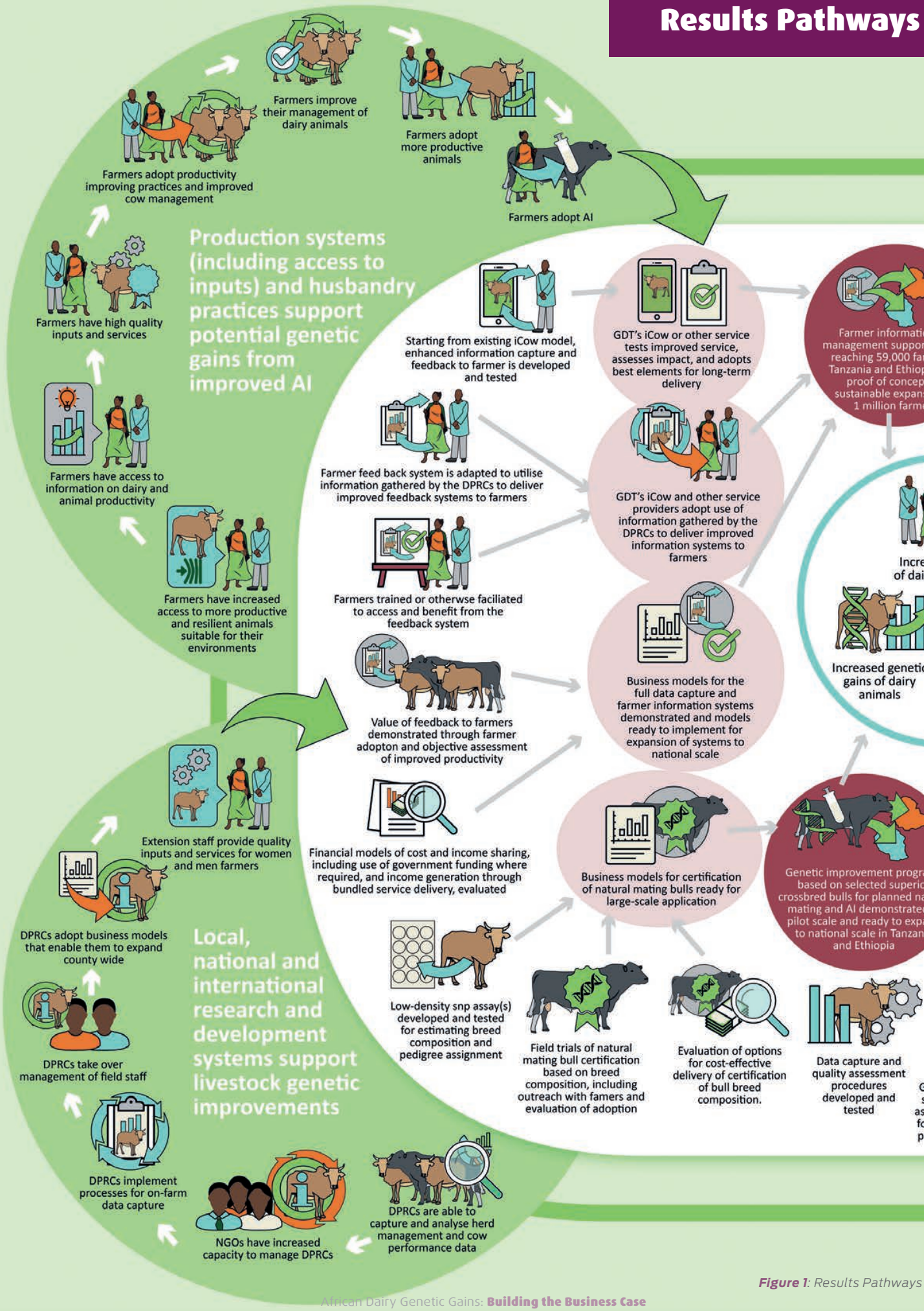
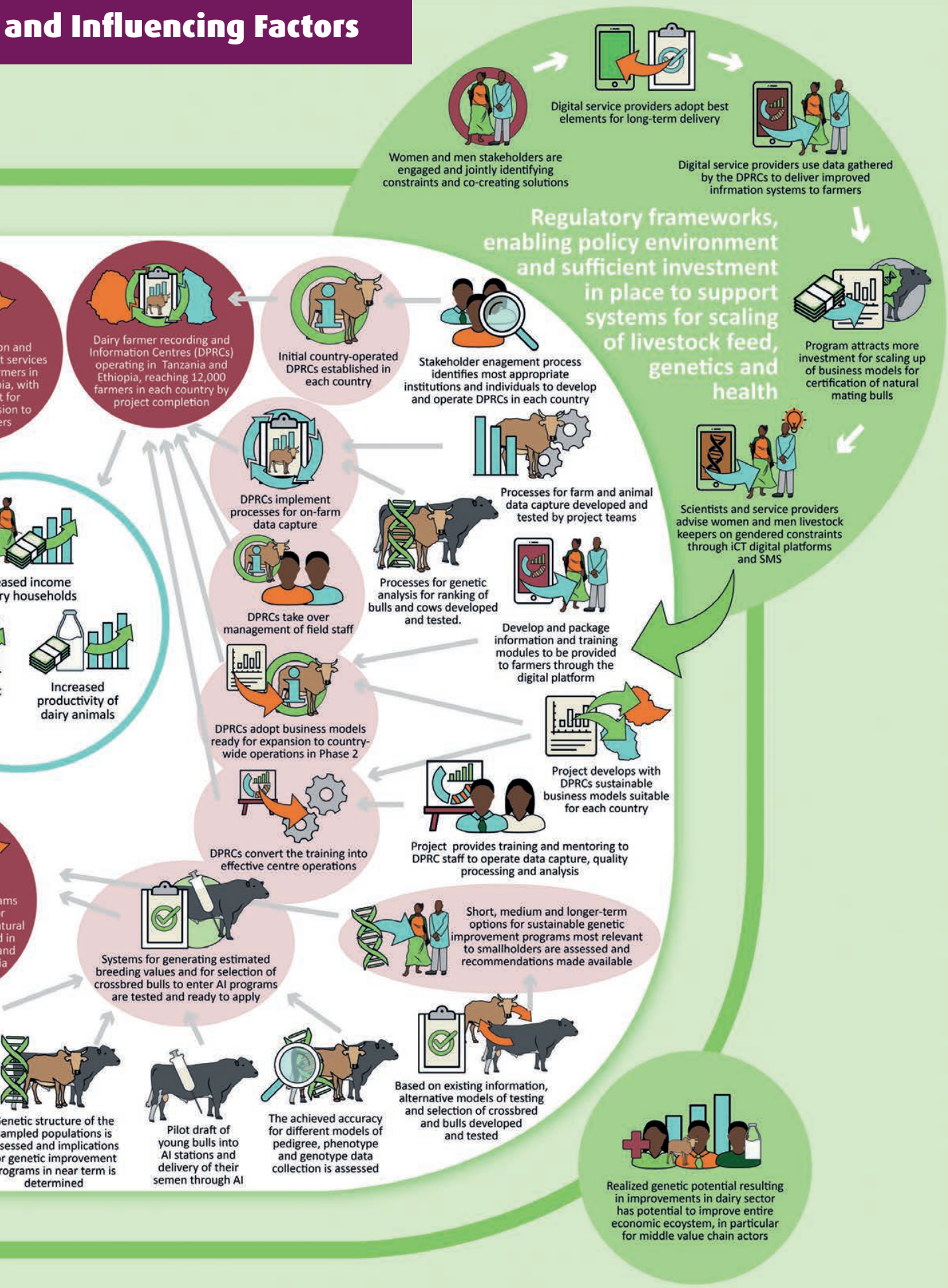


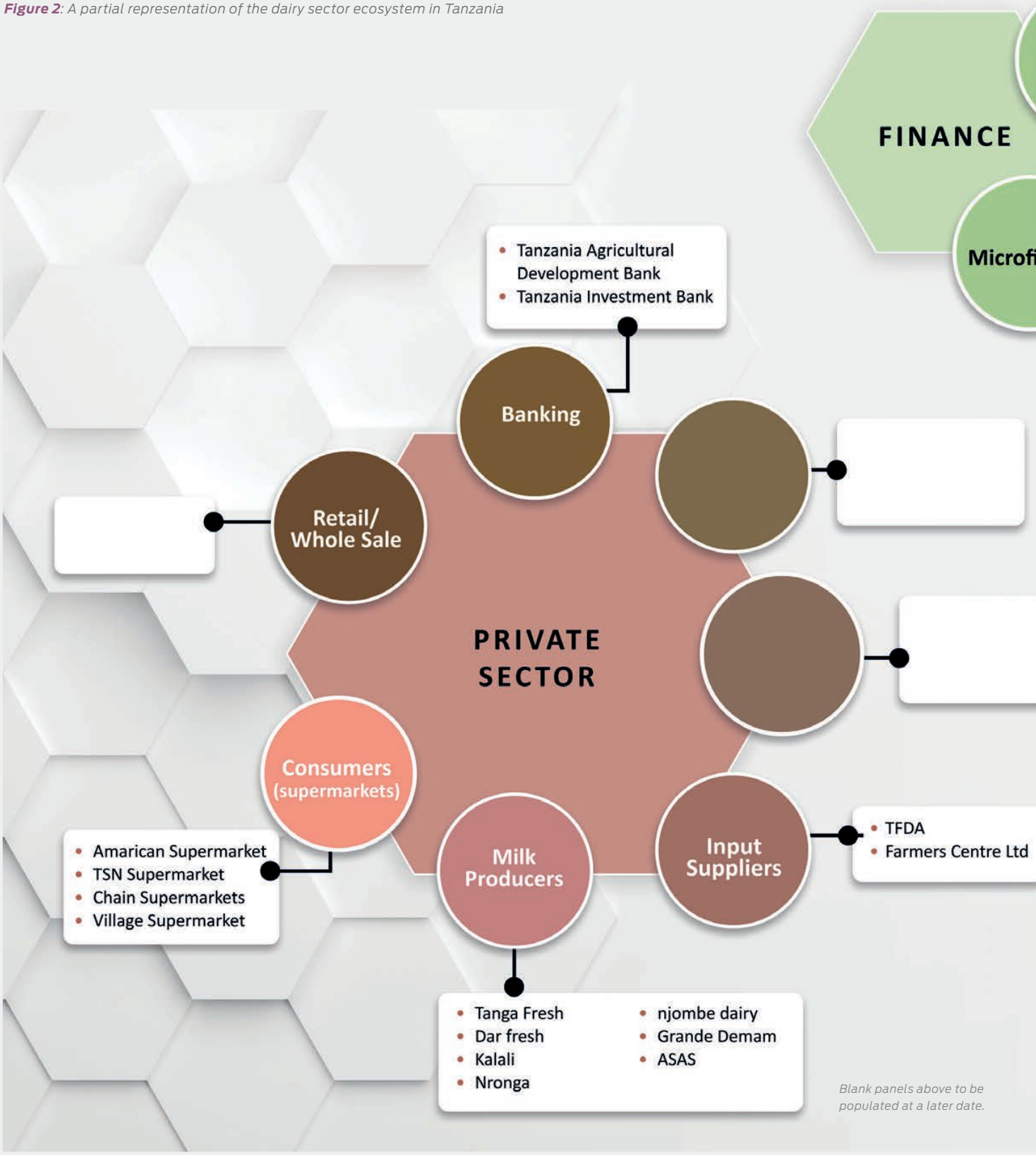
***Figure 1**: Results Pathways*

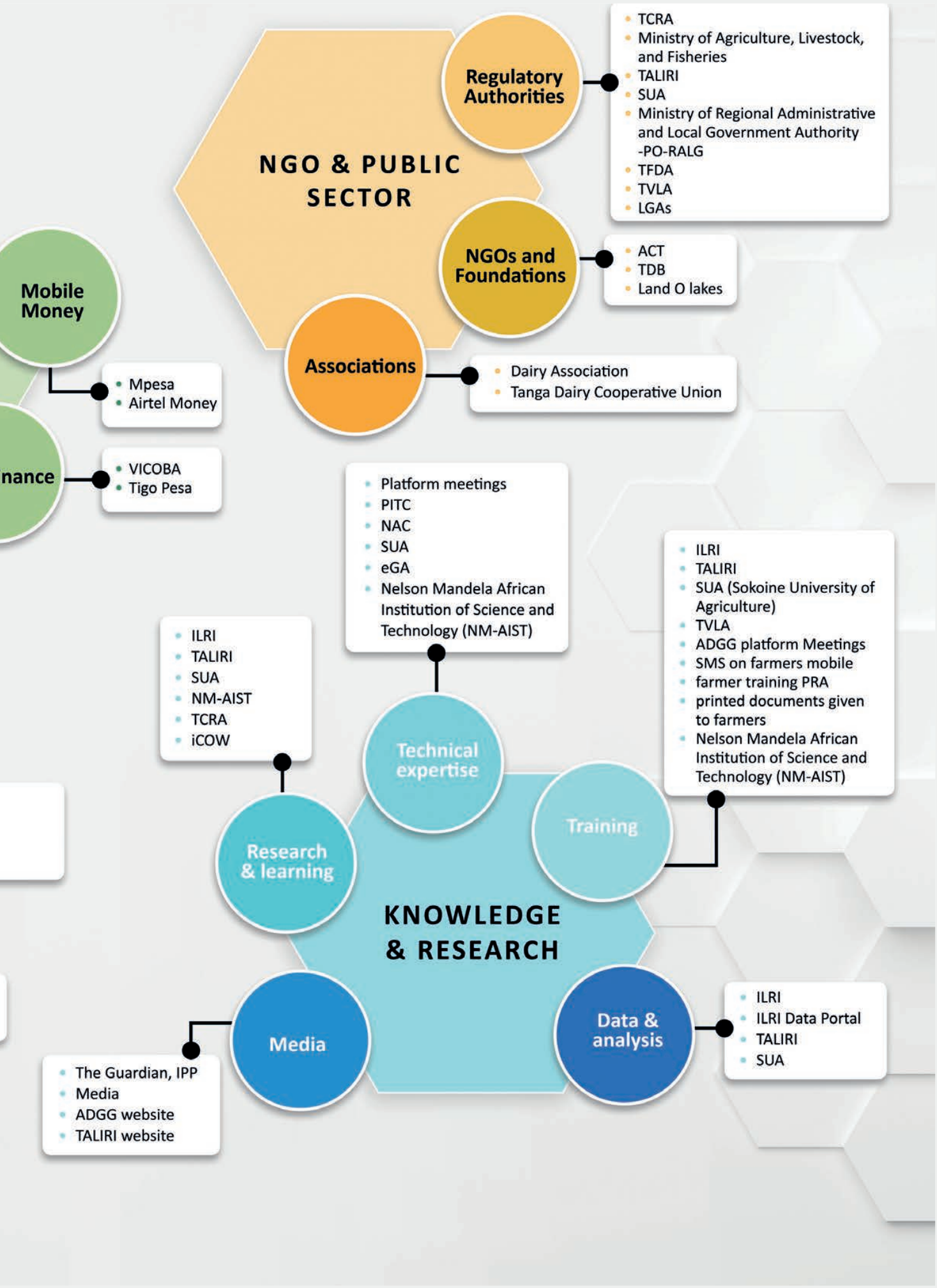
and Influencing Factors



Dairy sector ecosystem

Figure 2: A partial representation of the dairy sector ecosystem in Tanzania




NGO & PUBLIC SECTOR
Regulatory Authorities
TCRA
Ministry of Agriculture, Livestock, and Fisheries
TALIRI
SUA
Ministry of Regional Administrative and Local Government Authority -PO-RALG
TFDA
TVLA
LGAs
NGOs and Foundations
ACT
TDB
Land O lakes
Associations
Dairy Association
Tanga Dairy Cooperative Union
Mobile Money
Mpesa
Airtel Money
nance
VICOBA
Tigo Pesa
KNOWLEDGE & RESEARCH
Technical expertise
Platform meetings
PITC
NAC
SUA
eGA
Nelson Mandela African Institution of Science and Technology (NM-AIST)
Research & learning
ILRI
TALIRI
SUA
NM-AIST
TCRA
iCOW
Training
ILRI
TALIRI
SUA (Sokoine University of Agriculture)
TVLA
ADGG platform Meetings
SMS on farmers mobile
farmer training PRA
printed documents given to farmers
Nelson Mandela African Institution of Science and Technology (NM-AIST)
Media
The Guardian, IPP
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ADGG website
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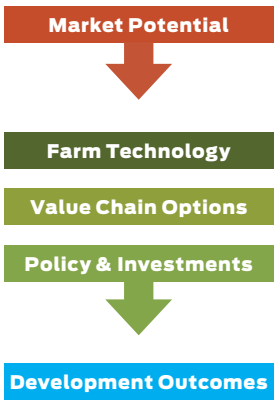
Data & analysis
ILRI
ILRI Data Portal
TALIRI
SUA

Integrated tools and data



Multi-market models
Output: Forecasted prices & quantities
Data: Production trends, income & price elasticities

Gross margin accounting
Output: Supply chain costs & profits
Data: Detailed input costs (incl. labor)

Spatial data analysis
Output: Suitable locations for farming & processing
Data: Agroecological conditions, roads, markets, etc.

Economywide CGE models
Output: Net impacts on GDP, jobs, poverty & diets
Data: Social accounting matrices

***Figure 3**: Integrated Tools and Data Requirements*

IV. Examining Market Potential
Analytical Frameworks and Tools in Perspective

26 ADGG aims to transition from its present largely 'farmer-first' approach to an inclusive 'market-first' approach so that the productivity gains made possible through innovations in the genetics sphere translate into improved income and nutrition status of participating farmers and their households.

27 Indeed, to make the business case for ADGG-generated technologies and thereby transform ADGG into an initiative capable of delivering on a wide range of socio-economic and environmental outcomes, a thorough and multi-dimensional analysis of the dairy value chain and the differential impacts of the investments on a select set of desirable national goals is needed. In this respect, presentations by IFPRI's **James Thurlow** and **Jawoo Koo** highlighted analytical tools used in other contexts that can help evaluate the efficacy of the market-first approach in the dairy sector through assessing market potentials, value chain options, spatio-temporal investment trade-offs and development outcome scenarios.

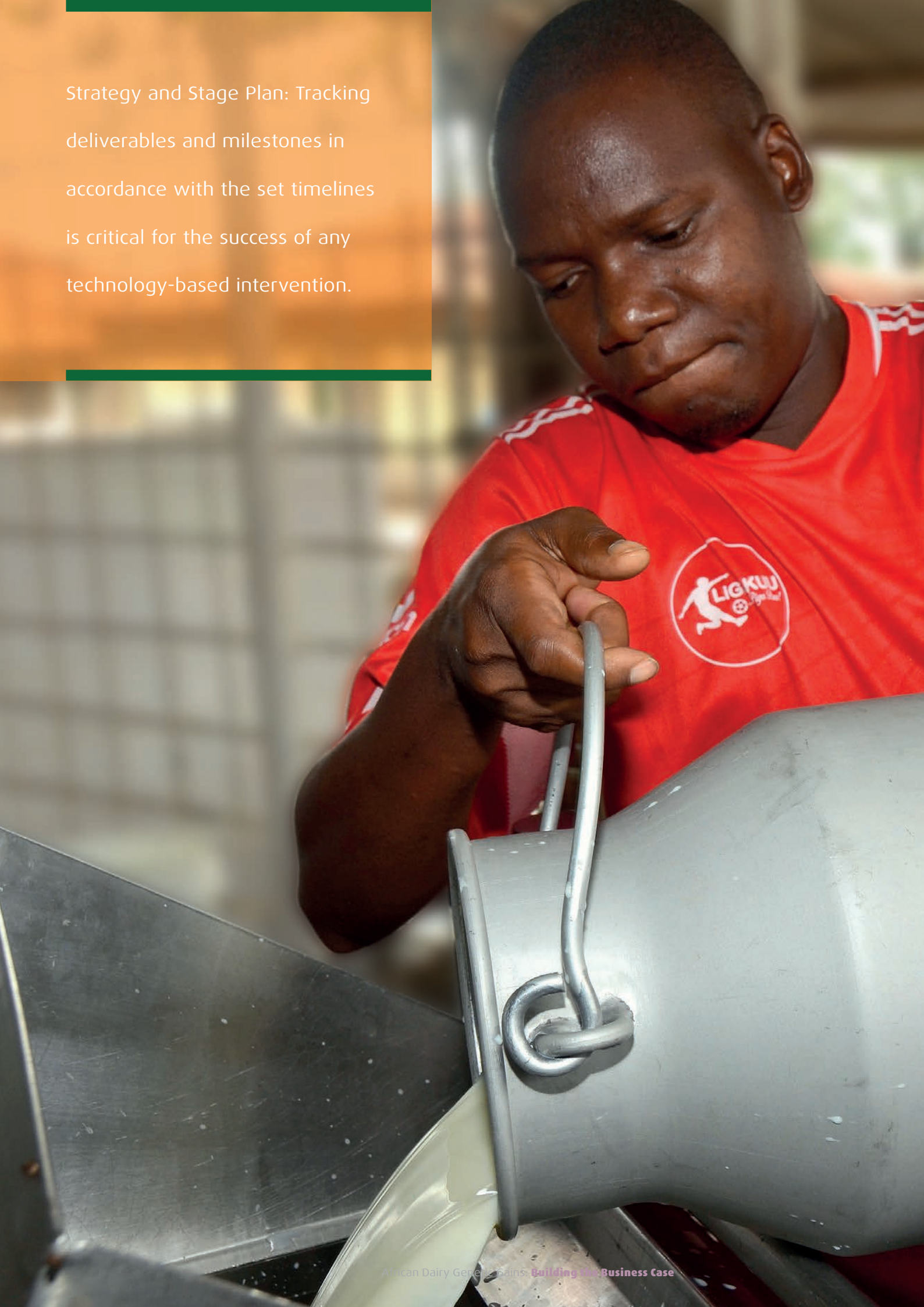
28 A value chain analysis is critical to assess and estimate the required productivity levels for competitiveness and the profitability of the dairy enterprises as well as to assess production risks. A spatial analysis perspective is essential because it helps one to pursue a spatially-differentiated production and marketing strategy and thereby target local markets with highest impact potential. Finally, a macro-economic perspective is vital because ultimately any intervention has a benefit and/or a cost to society. In order for ADGG-inspired dairy value chains to operate efficiently, supportive economic policies (e.g. subsidies for livestock inputs) and extensive public investments (e.g. use of the national agricultural extension system for AI provision) may be necessary. These investments need to be subjected to an economy-wide analysis that weighs corresponding development outcomes against alternative uses of the investments made and policy measures taken. Also, this perspective enables one to assess the effects of new and/or upgraded dairy value chains on the national economy.

29 The models as presented by Thurlow and Koo were of considerable help in analysing interventions from a value chain, geo-spatial and macro-economic perspectives, noting that each of these perspectives have distinct data requirements (Figure 3).

30 Thus, while the economic analyses above require data on input costs, margins, prices, incomes and expenditures pertaining to households and enterprises, the analysis required to develop spatially-differentiated strategy for market opportunities demands ***granular data*** – i.e., detailed, more sub-divided and specific, data sets on, *inter alia*, agro-ecology, human settlement characteristics, livestock density, and technical and physical infrastructure such as, respectively, markets and roads .

ADGG aims to transition from its present largely 'farmer-first' approach to an inclusive 'market-first' approach so that the productivity gains made possible through innovations in the genetics sphere translate into improved income and nutrition status of participating farmers and their households.

Strategy and Stage Plan: Tracking deliverables and milestones in accordance with the set timelines is critical for the success of any technology-based intervention.



V. Building the Business Case
Moving Agricultural Technologies to Markets (AgTech2M)

31 Gabrielle Persley (**Doyle Foundation**) presented a set of 10 interrelated methodological issues that she and **Kerri Wright Platais** have formulated for making the business case for transitioning agricultural technologies from discovery to delivery. These are:

i **Understanding market opportunity**: This includes identification of client needs and analysing market/trade trends.

ii **Availing the proposed solutions**: This relates to putting in place technology packages and pathways to delivery, suitable for various agro-ecologies.

iii **Technology description**: providing an informative description of the product and availing evidence about the viability of the technology in question.

iv **Identifying impact pathways**: Here, it is necessary to identify target countries and ecologies as well as the development outcomes expected of the technology package.

v **Ecosystem mapping** of technologies and geographies.

vi **Undertaking evidence-based benefits' analysis**: This encompasses the following dimensions: economic, gender, nutritional outcome, and environmental benefits.

vii **Identifying partnerships for delivery along the value chain**: This is about making effective use of existing organisations and networks in accordance with their respective mandates and competencies. Partners include public institutions at different spatial scales, private sector operators such as small and medium enterprises, international partners, and community organisations, including farmer groups.

viii **Investments**: Levels and sources of investment as well as returns to investment.

ix **Strategy and Stage Plan**: Tracking deliverables and milestones in accordance with the set timelines is critical for the success of any technology-based interventions.

x **Process and partners to make the business case**: Country and technology packages with specific, systems analysis to move to appropriate markets with the right partners.

VI. Bottlenecks to Business Case

32 In keeping with the participatory nature of the workshop, four groups deliberated on the following question: "What are the bottlenecks you would like to see tackled to make key production inputs for the dairy value chain (around animal health, feed, genetics and human nutrition) accessible and affordable?" The following provides a summary of the results of the group discussions:

1. Promote integrated analysis of the challenges of production inputs and explore the farm enterprise in its entirety, not just dairy.
2. Enhance farmers awareness around the different technologies. A related aspect is the need for promoting collective action through grouping dairy farmers together so that they could access inputs at reasonable cost.
3. Establish/strengthen national multi-stakeholder platforms to deliberate on challenges facing key dairy value chain actors and strategise on making inputs moreaccessible/affordable.

> "What are the bottlenecks you would like to see tackled to make key production inputs for the dairy value chain (around animal health, feed, genetics and human nutrition) accessible and affordable?"

4. Build on the experiences of complementary dairy development programmes, including the Eastern Africa Dairy Development (EADD) project and the Accelerated Value Chain Development (AVCD) programme, with regards to input provision to dairy farmers.
5. Given that some production inputs require constant power supply for their efficacy, it is essential to explore possibilities of using alternative sources of energy suitable for the conditions under which smallholder dairy farmers operate in Africa.

33 In seeking feedback from participants on the future priorities, each participant was given three sets of coloured cards (Green, Yellow, and Red), to specify what they consider as high priority for ADGG and PAID that warrant continued engagement (on Green card); issues for the future (on Yellow card) and interventions that needs to stop or at best slow down (on Red).

34 The participants' views are summarized in Box 1. The high priority issues included the following: (i) invest in a range of capacity strengthening measures with a focus on farmers and AI technicians; and (ii) strengthen the data capture system. The two most frequently noted Issues for the future were: (i) consider alternative technologies (including artificial intelligence) for artificial insemination; and (ii) design and implement business models that address issues beyond genetics. Two of the most frequently noted issues where the programs should slow down were (i) reconsider scaling to other countries before key bottlenecks are addressed in the current ADDG partner countries; and (ii) reconsider large breed promotion.

Annex 1
List of Participants

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Annex 2 **Workshop objective and programme**

African Dairy Genetic Gains **Building the Business Case**

8 and 9 October, 2018 • Windsor Hotel, Nairobi, Kenya

Workshop Objectives:

1. Take stock of critical research outcomes from ADGG to ensure market readiness along the dairy value chain in Ethiopia and Tanzania
2. Describe and discuss the supply chain and its bottlenecks for the Dairy Business Case
3. Discuss and begin Building the Business Case: How to Achieve Impact through Scale with Agricultural Technologies:
   - **a** Market Analysis
   - **b** Farm Technology/Value and Supply Chain Analysis/Investment Needs
   - **c** Partnerships and Development Outcomes – what does success look like in 5 years' time?

Day 1: Monday, 8 October, 2018		
9:00 am	**Introductions and Review of Agenda and Workshop Objectives**	D. Schillinger (*Welcome*) K. Wright Platais (*Moderator*)
9:30 am	**ADGG Update: Highlights from September Addis meeting and Phase I Accomplishments**	S. Kemp O. Mwai M. Hatley
10:00 am	**Coffee Break**	
10:30 am	**ADGG Country Updates – Ethiopia and Tanzania** ● Setting the Scene: Hear from country-led partnerships on what is in place, what exists in current value chain structures ● Identify bottlenecks or challenges to tackle moving forward (each country team identifies 3 current bottlenecks with a group discussion as how best to address each) *(40 minutes for per country with Q&A of 20 minutes each)*	*Ethiopia* T. Essayas Y.K. Zelalem J. Besufekad *Tanzania* D. Komwihangilo E. Lyatuu M. Hatley
12:30 pm	**Lunch**	
1:30 pm	**Hearing from Private and Public Sector Partners (panel discussion with Q&A)** ● Short overview of the role private and public-sector groups have in ADGG ● What will governments do to protect local producers ● What is needed at the retail/aggregators side to create an enabling environment ● What has worked for other value chain/producer experiences?	H.D. Belachew H. Githinji A. Kitalyi D. Admasu A. Madalla
2:15 pm	**Presentation from the Green Dreams Team** ● What role has GDT played for local producers, SMS use and reach ● Learnings from iCow Kenya and how ADGG may borrow and share ● How to modify/expand for Phase 2 planning	S. Kahumbu
3:00 pm	**Supply Chains and Dairy Impact Pathways – Making a Difference** ● Discussing the Supply Chain – what is it and how it differs from the Value Chain, why it is important for local dairy production ● Identifying components in the supply chain to create a landscape analysis for entry into the dairy sector ● Identifying competition in each country ● Addressing value chains and their profitability in the country systems	K. Downie E. Lyatuu J. Thurlow
3:45 pm	**Coffee Break (and break into teams)**	

4:00 pm	**Country Team Work**
	● Applying what we know to what we need. Break into Country Teams and dissect the components from previous presentations to begin to develop Country Action Plans
	  ● Market Analysis
	  ● Farm Technology/Value Chain Analysis/Investment Needs
	  ● Development Outcomes
	● Teams will report back in plenary for discussion around country take-aways and desired next steps at first part of Day 2
		Team Leaders

5:30 pm	**Summary of the Day**	G. Persley Y. Zewdie Lemma
6:00 pm	**Evening Cocktail Hour and Dinner on the Terrace**	

Day 2: Tuesday, 9 October, 2018		
9:00 am	**Reports from Ethiopia and Tanzania Teams**	Short reporting back (15 minutes per country team) with 10 minutes each for Q&A
10:00 am	**Examining Market Potential and an Analytical Framework – Tools and Lessons Learned from other value chains** ● Shifting from farmer first to market first, with inclusivity ● Farm production to market cycle examples ● Different models, approaches and tools ready for use in building the business case for dairy varieties and value chain	J. Thurlow J. Koo
11:00 am	**Coffee Break**	
11:30 am	**Build the Business Case for Moving Agtech2 Markets: 10 components** ● Discuss 10 components of Moving AgTech2 Markets methodology and approach to the business plan ● Discuss how Building the Business Case in Dairy will translate at the national level ● Discuss commonalities and differences for country needs, including the regulatory environment for safety/health	G. Persley
12:30 am	**Lunch**	

1:30 pm	**Bottlenecks to Business Case – What We Know and What We Need to Develop an Action Plan**
	● Group discussion and workshop take-aways
	  ● What is needed and what is missing to move ahead
	  ● Supply Chain inputs
	  ● Market Potential – Updating Outcomes
	  ● Partner roles, responsibilities and timelines
		Small Group Discussions

3:00 pm	**Coffee Break**	
3:30 pm	Hearing from ADGG and partners – The Way Forward	S. Kemp and O. Mwai
4:30 pm	Workshop Wrap-Up and Next Steps	K. Wright Platais and Team
5:00 pm	**Adjourn**	

Annex 3 **Acronyms and Abbreviations**

ACGG	African Chicken Genetic Gains
ADGG	African Dairy Genetic Gains
BMGF	Bill & Melinda Gates Foundation
DPRC	Dairy Performance Recording Centres
EADD	Eastern Africa Dairy Development
ILRI	International Livestock Research Institute
NAGII	National Animal Genetic Improvement Institute
NAIC	National Artificial Insemination Centre
PAID	Public-Private Partnership for Artificial Insemination Delivery

Dairy farmers

National institutions

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