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From Policy Promises to Result through Innovation in African Agriculture?

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Abstract: The problem addressed in this paper is the challenge of moving from formulating policy goals to achieving the promised results. The purpose is to assess the possible role of innovation in agriculture as a way of contributing towards achieving the Malabo Declaration commitments and the zero hunger Sustainable Development Goal 2 (SDG2) in six African countries. Since the SDGs are high on both international and many national agendas, there is a need to increase our knowledge of how to move beyond formulating goals. The approach includes both quantitative and qualitative data from a multisite research and development project. Moving from promises in relation to policy goals such as SDG2 and the Malabo Declaration to actions that make a difference at local level is a challenging task, and COVID-19 has added negatively to that challenge. Technological and institutional innovations exist that have the potential to improve the agricultural productivity, food security, and income levels of smallholder men and women farmers. However, innovation processes are hindered by barriers related to governmental, economic, knowledge-based, socio-cultural, and resource-based factors. To overcome these barriers, governance needs to go further than defining goals, and proceed to the next step of establishing effective implementation mechanisms that ensure the promised result.

Keywords: policy; governance; hunger; innovation; agriculture; Africa

1. Introduction

Poverty, inequalities and hunger continue to haunt the world, and COVID-19 makes these problems worse [1,2]. Extreme poverty is to a large degree a rural phenomenon and, according to projections, in 2050 the largest number of rural poor will live in Africa [3]. The number of undernourished people in the world is increasing, and the prevalence of undernourishment in Eastern and Middle Africa is particularly high, at almost 30% [4]. In

the Sustainable Development Goals (SDGs) and the African Union's (AU) Malabo Declaration, African leaders have committed themselves to reducing poverty, ending hunger and doubling the agricultural productivity and income of small-scale farmers in their countries [5,6]. The challenge for governments appears to be how to move from promises such as those made in international and regional fora, to actions that yield results; in other words, to know what processes and measures to put in place to ensure that the agreed goals are being realized. There is a whole range of existing technological and institutional innovations that could contribute towards reducing rural poverty and improving food security in Africa [7–9]. However, transferring or scaling-up technological and institutional innovations from one place to another has proven difficult [10,11]. Usually, successful technological and institutional change involves a whole range of factors, such as implementing conducive policies, enabling environments, constructing effective input and output chains, social learning, and behavioral change, etc. [12–14]. Innovations often come with high risks and uncertainties in relation to both natural and socio-economic factors such as drought, pests and diseases, high input prices, low output prices, and marketing constraints [15–17]. The purpose of this paper is to assess the role of innovation in agriculture as a way of contributing towards achieving policy goals. We will not discuss to what degree the policy goals are the right ones, nor the national ownership of the goals. Rather, we take the goals as a set frame. The main question we are asking is what opportunities and barriers exist for technological and institutional innovations that can contribute to achieving the Malabo Declaration and SDG2.3 in six African countries. We assess this question by drawing on data from the multisite agricultural research and development project "Innovations in Technology, Institutional and Extension Approaches towards Sustainable Agriculture and enhanced Food and Nutrition Security in Africa" (InnovAfrica) funded by the Horizon 2020 program of the European Commission. InnovAfrica tests and promotes a set of technological and institutional innovations in six Sub-Saharan African countries. Our theoretical approach is informed by international development studies and innovation theory, and by the High-Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security analytic framework for assessing barriers that hinder innovations from taking place [8].

2. Methods

Mixed methods, including both quantitative and qualitative approaches and with a multistage sampling process, were used. In the first stage, six Sub-Saharan African countries (Ethiopia, Kenya, Malawi, Rwanda, South Africa, and Tanzania) were purposively selected based on existing partnership and conducive environments for testing technological and institutional innovations in Africa. In the second stage, two sites in each country were purposively selected based on innovation potential in relation to relevant farming systems and representativity regarding agro-ecological zones. These sites were Ethiopia KM (Kombolcha and Meta), Kenya CM (central highlands and mid-altitude eastern region), Malawi MD (Mzimba and Dedza districts), Rwanda NK (Nyamagabe and Kirehe), South Africa F12 (Freestate: Qwaqwa and Harrismith) and Tanzania SC (southern highlands and coastal lowlands). In the third stage, in all study districts, a representative random sample of households was generated based on the Cochran formula for sample size calculation which was in some cases modified for smaller populations. Random households were selected from a census lists, and in the end a total of 3814 small-scale farmers were surveyed in the twelve sites, including 904 women and 2910 men small-scale farmers. A small-scale farmer was defined according to country definition in relation to land size or income level.

The questionnaire was developed with inputs from several project partners with complementary disciplinary backgrounds, and focused on topics including the socio-economic profiles of smallholders, current sustainable agriculture technologies, institutional and policy arrangements, and extension approaches in practice. Face-to-face interviews using the structured and pre-tested questionnaire were conducted with survey respondents. The survey was carried out in the 2017/2018 growing season in accordance with the guidelines

for research ethics of the project coordinators, the Norwegian Institute of Bioeconomy Research (NIBIO) and the Biosciences Eastern and Central Africa International Livestock Research Institute (BecA-ILRI Hub). The applicable national and institutional guidelines did not require explicit ethics approval. The regional, district and village authorities were informed and gave permission to carry out the interviews. All interviews were carried out on the basis of prior informed consent and the participants were ensured anonymity. In addition to the survey, qualitative methods such as focus group discussions (FGDs) and key informant interviews (KIIs) were used to collect, complement, and triangulate field data. The FGDs consisted of 10–15 participants who were purposely selected stakeholders, such as men and women small-scale farmers, value chain actors, extension and advisory service providers, researchers, ministry employees, and policymakers. A checklist was used to solicit information from the FGDs and KIIs.

The quantitative survey data were analyzed by use of statistical regression analysis and descriptive statistics, while the qualitative data were analyzed by making summaries of discussions and highlighting patterns that complemented the quantitative findings. In our analysis, we report both quantitative and qualitative findings of the barriers that hinder innovations from taking place in six African countries without using econometric models to test the causal relationship between the selected factors and the adoption of technological and institutional innovations. In addition to primary data, secondary sources such as reports from the United Nations and the African Union, were used to identify goals and to indicate to what degree policy goals are being achieved.

3. Innovation in Agriculture

To achieve the goals agreed upon in SDG2 on zero hunger and the Malabo Declaration, different kinds of actions at different levels that initiate change processes will be needed. Change can come about in many different ways; one way is through institutional and technical innovation. The Nobel Prize winner Angus Dayton [18] (p. 291) once observed that "there is no reason to suppose that what works in one place will work someplace else". His statement sums up insights from numerous unsuccessful efforts to transfer or scale up technological and institutional innovations from one place to another. A complex set of factors influences the degree to which innovations that have proven to be successful somewhere will also prove to be successful somewhere else. Some of these factors are beyond the control of individual farmers. It is often taken for granted that farmers have the resources to innovate, without realizing that participating demands a minimum asset threshold [19].

An innovation can be defined in different ways. Rogers [20] (p. 12) defines innovation as "an idea, practice or object that is perceived as new by an individual or group". A more comprehensive definition related to our study is given by HLPE [8] (p. 15) as a process by which "individuals, communities or organizations generate changes in the design, production or recycling of goods and services, as well as in the surrounding institutional environment including changes in practices, norms, markets and institutional arrangements, which may foster new networks of food production, processing, distribution and consumption".

Extension and advisory services play an important role in the application of scientific knowledge and technologies [12,17,20,21]. Extension theory includes the top-down technology transfer approach that dominated in the 1960s and 1970s; the bottom-up participatory approach that was introduced at the end of the 1980s; and the current pluralistic extension systems that are characterized by the co-existence of multiple actors and pedagogic approaches [9,20–23].

In this paper, we focus on the technological and institutional innovations that are initiated by outside actors and that are tested together with farmers to facilitate knowledge co-production between these actors and farmers in accordance with pluralistic extension theory. The innovations are known to be successful in other places but are new to the sites in this study. The technological innovations we focus on are cereal legume cropping

systems, improved seeds and Brachiaria fodder grass, and the institutional innovation is the village knowledge center (VKC). To understand barriers to innovation, we use the five categories suggested by HLPE [8] (p. 16) as the analytic framework, namely "governance factors, economic factors, resource factors, social and cultural factors, and knowledge factors". We use these barriers to innovation to address and discuss innovation capacity. To conceptualize the meaning of innovation capacity, we lean on Hall [24] (p. 265), who defined innovation capacity in relation to "context-specific factors needed to put knowledge into productive use", and Schut et al. [25] (p. 3) who defined it as the "ability of actors and organizations at local, regional and national level to develop new and mobilize existing knowledge to identify and prioritize constraints and opportunities for innovation in a dynamic systems context".

4. Results: Barriers to Innovation and Capacity to Innovate

In the following, findings in relation to opportunities that help, and barriers that hinder, innovation from taking place, are presented using the HLPE [8] analytic framework, including the categories of governance factors, economic factors, resource factors, social and cultural factors, and knowledge factors. These five partly overlapping categories are useful in understanding innovation barriers, but they do not directly suggest how to overcome the identified barriers [8]. Regarding innovation opportunities, in our presentation and discussion of our findings, we lean on Hall [24] and Schut et al.'s [25] conceptualizations of innovation capacity, which include capacity at the local as well as national level.

4.1. Governance Factors

We are addressing the question of what opportunities for and barriers to technological and institutional innovation exist, in order to contribute to achieving the Malabo Declaration and SDG2.3. First, we briefly review what these goals entail. Regarding SDG2, we are particularly interested in SDG2.3 in terms of doubling not only the productivity, but also the income, of small-scale food producers [6]:

> " *. . . by 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment*".

In this regard, small-scale food producers are those who farm land or livestock in the bottom 40% of land size or livestock number and "obtain annual economic revenue from agricultural activities falling in the bottom 40 percent of economic revenues" [26].

The Malabo Declaration's goals are to a large degree compatible with the SDGs, but they come from a process led by the African Union and should be attained by 2025, and not 2030, as specified for the SDGs. The Comprehensive Africa Agriculture Development Program (CAADP) was adopted in 2003 by African heads of states. The CAADP provides a policy framework for transforming agriculture and achieving economic growth, poverty reduction, and food and nutrition security in Africa. In 2014, the Malabo Declaration was adopted as a way of renewing the CAADP's intentions [5]. The Malabo Declaration includes nine main goals with several sub-goals. Some of the goals and sub-goals of particular interest to this paper are [5]:

> "*Commit to ending hunger in Africa by 2025, uphold earlier commitment to allocate at least 10 percent of public expenditure to agriculture, accelerate agricultural growth by at least doubling current agricultural productivity levels by year 2025, commit to halving poverty by the year 2025 through inclusive agriculture growth and transformation, create and enhance the necessary appropriate policy, institutional and budgetary support and conditions*".

The Malabo Declaration stresses commitment by governments. Governmental commitment can be understood to involve governmental action such as ensuring capable

institutional delivery mechanisms and necessary financial resource allocation [27]. The African Union is following up on commitments by monitoring how member countries score on specific indicators, such as the overall Malabo goals score, public expenditure to agriculture, doubling of agriculture productivity, access to agricultural inputs and technologies, and halving poverty through agriculture [28,29]. Malabo monitoring provides an opportunity to compare how the six countries are doing governance-wise in relation to each other, as well as showing the results in each country in 2017 and 2019.

The overall score from 2017 shows that Rwanda and Ethiopia were the only two countries on track to reach the Malabo goals, while in 2019 only Rwanda was still on track. Malawi, Ethiopia and Rwanda had the highest public expenditures on agriculture both in 2017 and 2019. Kenya and Rwanda were on track for doubling agricultural productivity in 2019. None of the countries were on track regarding access to agricultural inputs and technologies in 2019. In 2017, five of the countries were on track for halving poverty through agriculture, while in 2019 only Rwanda was still on track for this indicator. The trend is that except for Rwanda, the other five countries are not on track to reach the agreed Malabo goals in 2025 [28,29]. In addition, the impact of the COVID-19 pandemic will probably worsen the situation regarding goal achievements [1,2].

Governance is about appropriate and predictable policies, laws and regulations. It involves accountability, and state capabilities that include the government having skills, financial resources, and well-functioning organizational structures and service delivery systems [27]. Making promises and committing country leaders to achieve policy goals creates expectations of changes in governance that will yield results. The challenge of governments not being able to deliver on the implementation of policy and agreed goals is underlined in reports supported by the African Union. For example, Badiane et al. [30] stated that effective modalities are missing for going from high-level commitments to local action, and that such modalities involve the executive capacity and quality of sector governance. Implementing policy also concerns how to govern actor interactions and collaboration in ways that combine technological, social and institutional factors conducive to the capacity to innovate [31]. The monitoring of the Malabo Declaration shows a low capacity to implement policy and reach set goals in five of the six countries studied, with Rwanda as the exception [28,29]. Similarly, the FGDs in the same five countries underline that policy or set goals as such are not a problem in relation to creating an enabling environment for innovations to take place, but rather concern the implementation of the policies. Key informants in Rwanda explain the reasons why Rwanda appears to be more effective than the other five countries regarding policy implementation, with well-functioning public institutions that have staff performance evaluation systems that enhance accountability and employees' understanding of responsibility for achieving results. In addition, public sector employees benefit from having access to favorable transport schemes and mobile phone benefits that enable them to perform their job duties in an effective way.

4.2. Economic Factors

Economic factors as barriers to innovation include aspects such as market access, profitability in farming, risks and uncertainties [8]. In this study, we use access to markets measured as distance, and market constraints, as indicators of economic factors. Table 1 illustrates that traders and individuals (who are not formally perceived as traders) are the most important marketing channels for households who sell maize. However, many of the households interviewed do not sell maize. Malawi is the country wherein the most marketing of maize occurs. Low prices and unstable prices are given as the most important constraints in relation to marketing, as Table 1 shows. Low prices are also given as a constraint in relation to the marketing of milk in Rwanda and Kenya, where livestock system sites were selected. The FGDs and KIIs confirmed that low profitability in relation to both crop production and the sale of milk is an important challenge to improving the income of smallholders in the six selected countries. In Malawi, to address the problem of low farm gate prices, the government has established systems of floor prices and input

subsidies [32,33]. According to key informants, these measures have been somewhat helpful, but the subsidies are not reaching far and the farmers tend to sell their maize crop below the floor price to private traders, because they cannot afford to wait for the Agricultural Development and Marketing Corporation (ADMARC) to turn up in their village.

Table 1. Access to different market channels and market access constraints.

(a) Access to Market Through Different Channels (Maize)

	Ethiopia KM	Malawi MD	South Africa F12	Tanzania SC
Traders/private agents	12 (2.0%)	146 (22.4%)	0 (0.0%9	20 (2.9%)
Individuals	8 (1.3%)	103 (15.8%)	25 (4.1%)	30 (4.3%)
State agencies/Cooperatives	0 (0.0%)	24 (3.7%)	1 (0.2%)	0 (0.0%)
Others	21 (3.4%)	35 (5.4%)	1 (0.2%)	1 (0.1%)
Total n	*615*	*653*	*604*	*697*

(b) Market Constraints (Maize)

Constraints	Ethiopia KM			Malawi MD			South Africa F12			Tanzania SC		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Delay or irregular payment	2	1	0	12	6	3	16	45	74	0	0	0
Long distance to market	0	3	7	8	13	97	21	39	15	1	0	13
Low or unstable price	14	10	3	229	170	36	42	19	25	34	29	2
Not always able to sell	2	0	4	12	10	12	65	26	12	4	4	2
Others	1	1	1	6	3	3	41	40	40	6	3	3

Source: InnovAfrica household survey 2017–2018 [34]. Note 1: The numbers 1, 2 and 3 relate to the ranking of constraints according to importance. Note 2: Kenya and Rwanda are not incorporated because maize–legume innovations are not included in these two countries. Note 3: n is the total number of participants, including those who responded and those who did not respond.

Economic factors can be addressed at the local level, as experienced by farmers regarding market access and constraints. However, economic factors as barriers to innovation play a similarly important role at the national level, as the government needs to have the economic capacity to ensure public goods in the form of service delivery [27]. It is difficult to obviate the need for public investment in the agricultural sector in order to achieve SDG2.3 and the Malabo goals. However, in total, government spending on agriculture decreased in the period 2001 to 2017, and it was the lowest in Sub-Saharan Africa [35]. The Malabo Declaration renewed the CAADP commitment of the allocation 10% of annual public expenditure to agriculture, which is a target that the countries struggle to meet [29]. The government has an important role to play ensuring that the agricultural sector is not penalized in national policy [4], e.g., regarding price policy, taxation, financial services, marketing and trade.

4.3. Resource Factors

Resource factors as barriers to innovation include matters such as access to land, water, seeds, and credit [8]. Small land sizes and the lack of capital have contributed to a limited capacity to innovate. In all six countries, small land size was given as a major barrier to innovation. Innovations often require investment (such as buying seed, paying for membership in a VKC, or paying for cash cards for mobile phones). To assess the capital situation, we use the number of respondents who have accessed loans as an indicator of access to credit, and the use of local and/or improved seed from the formal seed system as an indicator of access to seed resources. Rwanda, at almost 40%, has the highest percentage of households who accessed credit during the last 12 months, followed by Kenya, Ethiopia, Malawi and Tanzania at 18%. Family and friends are the main sources of credit. Other sources are village banking and self-help groups. In Ethiopia, private money lenders come second after family/friends, while in Kenya, cooperatives and micro-finance institutions are the major credit providers, as well as public and private banks. In South Africa, farmers

regarded as subsistence farmers do not have access to credit mostly because they do not have formal employment and they have no credit record, while large cooperatives lend to emerging and commercial farmers. The main reasons for taking loans in Kenya are to purchase inputs and to pay school fees. In Rwanda, self-help groups are a major source of credit, and the loans are spent on education, health, and different agricultural activities. The main findings show that, on average, about one third of the respondents had accessed credit in the previous year, but less than half of that credit was used in agricultural production.

The availability of and access to quality seed is of great importance for agricultural innovation to take place. In Ethiopia, Malawi and Tanzania, where seed systems data were collected, the findings show that informal seed supply through the saving of seeds from harvest and exchange through social networks dominate seed supply for most crops in the three countries. In maize production, improved seeds are used more than in other crops, where there is hardly any use of improved seed from the formal seed system, apart from some vegetable seeds. In Ethiopia, 25% of the maize seed planted is improved seed from the formal seed system, while in Tanzania and Malawi, the contribution is 58% and 61%, respectively [36]. Private traders such as agro-dealers are the most important source of improved maize seed in Malawi and Tanzania, while in Ethiopia, cooperatives and the government are the most used improved seed channels. The capacity to innovate may demand well-functioning seed systems that can secure affordable and stable supplies of high-quality seed. Different aspects of seed system development could include seed laws that allow for pluralistic approaches to seed delivery, the public breeding of open pollinated crops and crops with limited private sector interest, participatory plant-breeding schemes, cooperative seed production such as in Ethiopia [37], and quality declared seed (QDS) such as in Tanzania [36]. Ethiopia has approved a pluralistic seed system development strategy (PSSDS) that proposes support for all three major seed systems operating in the country (informal, formal and intermediate seed systems) [37]. As expected, different resource factors constitute important barriers to innovation that need attention when translating policy promises to results.

4.4. Social and Cultural Factors

Social and cultural factors as barriers to innovation include aspects such as gender roles, decision-making power, and social capital [8]. Women farmers play an important role in agriculture, as men often seek off-farm employment while women remain behind to cultivate the land and take care of the family [38,39]. Innovations often require additional resources in the form of time or labor inputs [40,41]. In the survey, decision-making power at the household level, and the division of labor in agriculture between male and female household members, are used as indicators of social and cultural factors for the gender dimension. Regarding decision-making power, our findings show that joint decision-making involving both husbands and wives was the most common practice. In South Africa, where smallholder agriculture is basically a woman's activity, women dominate agricultural decision-making. In Malawi and Rwanda, women play a slightly more important role than men in decisions about borrowing money, sale of products, use of income, membership of associations, and participation in extension and training activities. In Ethiopia and Tanzania, men play more important roles in these decision-making processes than women. Qualitative findings from the countries indicate that there is a shortage of labor, in particular female labor. Women already work long days and have a limited capacity to take on new tasks.

Gender roles and labor demands are important factors to recognize when capacity for innovation is assessed [42–44]. The findings of this study suggest that, except in Ethiopia, women perform more than half of the agricultural tasks, such as land preparation, planting, weeding, and harvesting in the selected countries. Agricultural innovation might contribute to increasing the workload of rural women, which in turn may reduce women's time for cooking for their families; thus, women may be able to cope by extending their work day or transferring duties to other female members of the household [43].

Technological innovations might also lead to increased productivity and income, but there is no automatic link between increased agricultural production and improved food and nutrition security, because whoever controls income and makes decisions in the household will play a role [40,41,45]. Among the six countries, the global gender gap score varies greatly; Rwanda and South Africa are more gender-responsive countries, while the other countries score low [46]. However, in the FGDs in the current study, results differed. In Rwanda, the view of women was that there exist big difference between men and women in the country, e.g., regarding mobility and domestic duties. However, the women recognized that in an African context, Rwanda was doing rather well regarding gender equality, e.g., in relation to political participation, but that there was still a way to go to achieve equality. The increased labor demand that innovations might claim, and the situation of already-overworked women smallholders, call for smart solutions to address workload barriers. Dahlin and Rusinamhodzi [47] categorize innovations according to return and labor demand, suggesting that high yield returns but low labor demand will be preferable, while high yields with high labor demand will require investments in resources such as low-cost machinery and/or herbicides to reduce labor input.

4.5. Knowledge Factors

Knowledge factors as barriers to innovation include the availability of and access to information such as technologies, associations, markets and farm gate prices [8]. We use access to extension and advisory services (EAS) and membership in associations as indicators of access to knowledge and information. In EAS, we include public extension, farmer-to-farmer extension, research outreach, private entities and agro-dealers, cooperative societies, NGOs, and insurance companies. The results in Table 2 indicate that there are large differences among the six countries in terms of access to EAS. South Africa and Tanzania have the lowest EAS access, while in Ethiopia, Kenya and Malawi, around one-third of the households had access to EAS during the last 12 months.

Table 2. Female and male headed households having access to crop- and/or fodder-related EAS during the last 12 months (percentage).

EAS	Ethiopia KM Crop	Kenya CM Fodder	Malawi MD Crop	Rwanda NK Fodder	South Africa F12 Crop	Tanzania SC Crop/Fodder
Female HH visited	31.9	29.5	32.4	8.9	1.0	3.7/0.0
Male HH visited	39.1	35.2	34.4	13.9	2.0	7.8/2.4
Total	38.5	34.0	33.8	12.8	1.5	7.2/2.0

Source: InnovAfrica household survey 2017–2018 [34].

The six countries all have pluralistic extension systems and policies with goals of providing EAS. However, the overall coverage of EAS is insufficient, and many smallholders have not been visited by any EAS providers. In addition, EAS not only concerns coverage in quantitative terms, but it also involves the quality of the service provided in relation to farmer needs, as well as the motivation of EAS staff. It is also interesting to note who the EAS providers are, and how the diversity of providers is spread out between female-headed and male-headed households. The public extension system is the most important provider of extension for both male- and female-headed households in Ethiopia, Kenya, Malawi, South Africa and Tanzania. Male-headed households are visited by a more diverse number of EAS providers than female-headed households. In Rwanda, the research institution is the most important service provider. Kenya is the only country where insurance companies play a substantial role as a service provider, while NGOs and private companies do not play important roles in any of the selected countries. In the FGDs, it became clear that advice provided by EAS was not always regarded as being

useful in the farmer's situation, e.g., in relation to risks, uncertainties, markets and prices. It was reported that EAS providers tend to focus on technological advice without linking technology to income and market opportunities. As a woman farmer expressed it: Do not demoralise farmers by telling them to grow something without a stable market. It also became clear that EAS providers have challenging working conditions, with limited facilities and few incentives. Kenya and Tanzania report serious problems in the staffing, mobility, and technical capacity of the extension officers in their countries.

The availability of and membership in different associations such as production groups, farmer field schools, credit and saving groups, women groups, farmer organizations, and cooperatives is the second indicator we used in this study to assess knowledge factors. Table 3 shows that the number of households with at least one household member in an agricultural association is relatively low, except in Kenya, where more than half of the households have at least one household member who is a member of an association. In South Africa, almost none of the households have a household member belonging to an association.

Table 3. Households with at least one household member in agricultural association (in percentage).

	Ethiopia KM	Kenya CM	Malawi MD	Rwanda NK	South Africa F	Tanzania SC
Female	2.3	17.8	14.5	13.8	-	7.0
Male	9.9	39.4	12.1	24.7	0.5	16.2
Other	0.5	0.2	0.3	1.1	0.2	0.7
Total	12.2	56.4	26.5	35.4	0.7	22.0
n	*615*	*629*	*653*	*616*	*604*	*697*

Source: InnovAfrica household survey 2017–2018 [34].

Smallholder farmers are poorly organized with limited membership in associations that could enhance knowledge, as the findings illustrate. The quality of the associations also varies. As a woman farmer put it: *It is basically a waste to become a member of an association because the associations do not have much to offer*. The main finding in relation to knowledge factors as barriers to innovation is that we must look beyond EAS access and association membership in quantitative terms and assess how farmers perceive whether what EAS and groups have to offer is of use to them. In addition, the motivation of EAS staff is of great importance; conducive incentive systems should be put in place to ensure that knowledge factors do not limit capacity to innovate.

Preliminary lessons from the establishment of VKCs in Kenya and Tanzania indicate the valuable opportunities and the huge interest in such centers. The objectives of the VKCs are to empower rural communities with timely and appropriate knowledge, ensure connectivity and capacity development, bridge knowledge gaps, and improve the gender balance in extension services. The challenges are the cost of establishing such centers and the sustainability of running them, but not a lack of interest among rural men and women smallholders, since the opposite appears to be true. Key informants indicated that the VKCs had good effects by being complementary to public extension and advisory services, and by facilitating farmer-to-farmer extension. In Kenya, to enhance sustainability, a small membership was established, which also contributed to farmers feeling more ownership to the VKC.

4.6. Barriers to Innovation

To illustrate the main barriers that hinder innovation, in Table 4 we have combined the six countries with the selected technical innovations and the barriers to innovation, to generate an overview of the importance of the different barriers. For the Brachiaria grass, the findings from Kenya, Rwanda and Tanzania confirm that lack of seed access, small land size and lack of extension, including awareness, are significant constraints. At the same time, the shortage of fodder, in particular seasonal feed scarcity, is a major constraint in

small-scale dairy production in the three countries. Brachiaria grass provides opportunities for increasing the availability of quality fodder throughout the year [48,49].

Table 4. Summary of barriers to innovation.

Barriers Country Innovations	Governance: Malabo Scores 2017/2019 *	Economic	Resource	Social and Cultural	Knowledge
Ethiopia KM (a) Cereal–legume cropping systems	5.3/5.3 of 10	-Market	-Credit -Land	-Decision-making	-Extension
(b) Improved seed			-Credit		-Ext./membership
Kenya CM Brachiaria grass	4.8/4.9 of 10		-Seed -Land		-Extension
Malawi MD (a) Cereal legume cropping systems	4.9/4.8 of 10	-Market	-Credit -Land	-Decision-making -Gender	-Extension -Membership
(b) Improved seed				-Gender	-Education -Membership
Rwanda NK Brachiaria grass	6.1/7.2 of 10		-Land -Seed		-Extension
South Africa F12 (a) Cereal–legume cropping systems	4.1/2.9 of 10	-Market	-Land	-Gender	-Education
(b) Improved seed					-Extension
Tanzania SC (a) Brachiaria	3.1/5.1 of 10		-Land -Seed		-Extension
(b) Cereal legume cropping systems			-Credit	-Gender	
(c) Improved seed					-Education

Source: * [28,29]; InnovAfrica household survey 2017–2018 (Significant at 10% level) [34].

Regarding cereal–legume intercropping systems in Ethiopia, Malawi, South Africa and Tanzania, the markets in three of the four countries are significant constraints, as are small land size in all four countries, lack of credit or access to seed in all four countries, gender factors in all four countries, and lack of extension or education in all four countries. As for the Brachiaria grass, cereal–legume intercropping systems hold promising potential regarding improving yield, soil quality, income and food security among small-scale farmers in Africa [50].

It is evident that the barriers to innovation extend across all barrier categories. For most smallholders, overcoming these barriers is indeed a challenge, if appropriate measures are not implemented to improve their capacity to innovate. However, there are also small-scale farmers who have enough capacity to innovate, and who want to take part in technological trials and institutional change. Obviously, the capacity to innovate varies among countries, and among smallholders within the same country. Those responsible for the scaling need to recognize these differences in innovation capacity, which takes us back to Dayton's [18] (p. 291) proposition that there is no reason to suppose that what works in one place will work somewhere else. We would argue that the chance exists that such innovations could work for somebody somewhere else who has the capacity to innovate. For those who do not have such capacity, innovations should be better adapted to their situation, or their situation should become more conducive to the type of innovation in question.

5. Discussion: From Policy Promises to Results through Innovation in African Agriculture

When moving from policy promises to results, capacity to innovate is an important factor regarding benefitting from innovations. Capacity to innovate is uneven and varies from country to country (e.g., Rwanda is doing better than the other countries in the study), and from one smallholder farmer to another (e.g., in terms of land size and gender). On average, capacity to innovate is low, as illustrated by the analysis of governance factors, economic factors, knowledge factors, social and cultural factors, and resource factors. Juma [7] (p. 82) states that agricultural innovations have the potential to transform African agriculture, but only if strong structures are put in place. Similarly, Badiane et al. [30] underline the lack of effective modalities, including executive capacity and quality governance. Governance factors are of vital importance as smallholder farmers cannot be expected to have the capacity to innovate when the enabling environment is not there, and when participating demands a minimum asset threshold [9,14,19] and comes with high risks [16,21]. However, when discussing innovation capacity, the kind of innovation needs to be made clear. Some innovations might demand more capital, land, and labor than others. If the capacity to innovate is low, it could be that different innovations better suited to the local situation are needed. In a situation of the feminization of small-scale agriculture, innovations that come with high yield returns but low labor demands will be preferable [43,47].

Despite the low average innovation capacity, a considerable number of small-scale men and women farmers do have the capacity to innovate, and they are eager to enter into technological and institutional changes. These small-scale farmers are characterized by somewhat better access to land, labor, markets, credit, and extension, and they can afford to take risks. The goals in the Malabo Declaration state halving poverty through agriculture [5], and SDG 2.3 emphasizes doubling not only the productivity, but also the income of small-scale food producers—these being those who farm land or livestock in the bottom 40% of land size or livestock number, and the bottom 40% regarding economic revenues from agricultural activities [6,26]. Hence, to accomplish the Malabo and SDG2.3 goals that the governments have committed themselves to achieving, there is a need to improve the innovation capacity of the poorest 40% of the small-scale farmers, and in particular, women [38,43,44]. Those who have the capacity to innovate do not appear to be the same groups as those being targeted by the SDG2.3 and Malabo Declaration policy goals. Rwanda scores highest on the Malabo Declaration's "halving poverty through agriculture" indicator, and lessons can be learned from Rwanda's targeting and agricultural public goods policy, as well as their implementation capabilities. Translating policy promises such as the Malabo Declaration and SDG2.3 into actions that yield results is indeed demanding. To get results, it is important to address barriers related to governance, economy, knowledge, socio-cultural factors, and resource factors [8]. However, these barriers need to be addressed in a way that improves the capacity to innovate among the lowest 40% and with a focus on women smallholders [5,6,26]. Enhancing the ability of those at the bottom of the ladder to develop new, and mobilize existing, knowledge by recognizing constraints and opportunities for innovations to go their way will be a means of achieving the promises made in the SDG2.3 and the Malabo Declaration [9,19,51].

6. Conclusions

In this paper, we assess the possible role of innovations in agriculture as a way of contributing towards achieving the Malabo Declaration and the SDG2.3 goals in six African countries, taking the goals as a set frame. Moving from promises in relation to policy goals such as SDG2 and the Malabo Declaration to actions that make a difference at the local level is a challenging task, and COVID-19 has added negatively to that challenge. Technological and institutional innovations exist that have the potential to improve the agricultural productivity, food security and income levels of smallholder men and women farmers. However, innovation processes are hindered by barriers related to governance, the

economy, knowledge, socio-cultural factors, and resource factors. To overcome the barriers, there is a need to go beyond defining goals, and proceed to the next step of establishing effective implementation mechanisms or institutional arrangements. These mechanisms should not only address economic and resource barriers and the need for investment, but also ease barriers in the areas of governance and socio-cultural contexts. In particular, a question for further research is how to ensure the kind of governance and institutions that translates leadership commitments into improved capacities to innovate at the local level, thus enhancing the ability of those 40% at the bottom of the ladder.

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Institutional Review Board Statement: The study was carried out in accordance with the guidelines for research ethics of the project coordinators, the Norwegian Institute of Bioeconomy Research (NIBIO) and the Biosciences Eastern and Central Africa International Livestock Research Institute (BecA-ILRI Hub) [52], and in accordance with the relevant guidelines of the organizations conducting the surveys and focus group discussions in Ethiopia, Kenya, Malawi, Rwanda, South Africa and Tanzania. The applicable national and institutional guidelines did not require an explicit ethics approval. We informed the state, district and village authorities and they gave permission to carry out the surveys and focus group discussions.

Informed Consent Statement: The regional, district and village authorities in the six countries were informed and gave permission to carry out the surveys and focus group discussions in each country site. The selected respondents were informed about the objective of the surveys and of the focus group discussions, and interviews were always carried out on the basis of prior informed consent to participate in the survey, group discussions and interviews. The participants were ensured anonymity.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not yet publicly available due to protection of privacy linked to personal data. A data repository is under construction by the Biosciences Eastern and Central Africa International Livestock Research Institute (BecA-ILRI Hub) [52].

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