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Sustainable food systems and indigenous vegetables Final Report

SCENARI

SASS
Sustainable Food Systems
and Indigenous Vegetables

Final Report

Sustainable Agrifood Systems Strategies



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Introduction-SASS

The Sustainable Agrifood Systems Strategies (SASS) Project was financed by the Ministry of Education, University and Research (MIUR), and it engaged a multidisciplinary team of biologists, agronomists, microbiologists, botanists, economists, sociologists, medical doctors, nutritionists and anthropologists. The purpose of the research was to map and to analyze the local food systems of three East African areas – in the northern and central part of Tanzania and the Nakuru county in Kenya – with an interdisciplinary, synergic, interactive and participatory approach.

The project intended to investigate the agro-nutritional systems, both from a techno-scientific and socio-political point of view, to provide a full overview of the situation by integrating the results from all the disciplinary fields involved. By focusing mostly on the Indigenous Vegetables value chains, the overarching topic around which the research was developed was to ascertain if diversification of the local food system can support improvements in its economic, social and environmental sustainability. Researchers analysed in particular: the role of small-scale farming systems in stimulating sustainable place-based rural development practices; the suitability of developing forms of social-collective action or social organizations as a way to help the

small farmers in tackling the problems connected with the production and distribution of their local products; the food habits and food knowledge of women in childbearing age; the role of traditional agricultural practices and the cultivation of local products for preserving biodiversity and stimulating soil climate resilience.

As the project seeks to contribute to transformative change, SASS aimed, from research design to implementation, to also help local stakeholders and policy makers use the emerging analysis and suggestions to improve interventions for food system sustainability. An enabling policy and investment environment that makes sustainable food production and diversity of diets both affordable and attractive to producers and consumers is indeed particularly urgent in Africa, given not only the persistent problems of food and nutrition insecurity, but also the already serious depletion of Africa's natural resources, increasing social and economic inequalities as well as the worrying effects of climate.

Chapter 1

Diversification vs. unsustainability of the global food system

The global food system is characterized by several unsustainable aspects, concerning food production, distribution and consumption. The environment is highly affected by the production system, including agriculture. Despite this, agriculture still represents a fundamental resource for reducing poverty and hunger.



52%

of agricultural production land is degraded



29%

Global GHGs release by food systems



80%

of global deforestation is caused by agriculture



70%

of terrestrial biodiversity loss are linked to food production drivers



70%

of freshwater is used for agriculture

Source: Living Planet Report 2020, WWF

THE ISSUE

A food system comprises all processes associated with growing, harvesting, storing, processing, packing, transporting, marketing, consuming and disposing of food as well as the political, economic, social, technological and cultural issues that drive and/or constrain their dynamics (See Figure 1).¹



Source: van Berkum et al., 2018

Figure 1. Food system framework.

Many local food systems worldwide and their combination into national and international food systems display a low degree of sustainability. Several experts and international organisations, e.g., call for “a paradigm shift from industrial agriculture to diversified agro-ecological systems”,² as these latter can be competitive, perform particularly strongly under environmental stress, and pave the way for improved

1 “A food system is defined as ‘All elements and activities that relate to production, processing, distribution, preparation, and consumption of food’ (Willett et al., 2019, p). This includes the environment, people, inputs, processes, infrastructure, and institutions involved that take food from farm to mouth (IFPRI, 2016).”

2 IPES-Food. 2016. From uniformity to diversity: a paradigm shift from industrial agriculture to diversified agroecological systems. International Panel of Experts on Sustainable Food systems. www.ipes-food.org

health. One key way to foster sustainability in food systems is diversification, which could be done through supporting the production, marketing and consumption of more sustainable food items compared to standard crops, such as those based on indigenous vegetables (e.g., amaranth, millet or certain leafy vegetables).

This proposed pathway to improved sustainability originates from an increasing body of literature on the benefits of indigenous vegetables. These are generally highly nutritious, commonly they have low requirements in terms of natural resources and farming inputs, and they can contribute to increasing (agro-) biodiversity and climate resilience. Their diversity also allows to generate income for the rural poor, especially for women who are often responsible for their cultivation, processing and marketing and local knowledge of domesticated and wild vegetables.

Although food systems have the potential to nurture human health and support environmental sustainability, the current global food system is unsustainable in terms of environmental impact, socio-economic inequalities, and healthy diets. All these aspects are directly related to the risk of food insecurity that affects many developing countries' populations. For instance, the loss of biodiversity affects the resilience of local food systems. This loss is caused by climate change, land-use change and overexploitation in terms of urbanization, and agricultural cover, that reduce the natural variety of plant, pollinators and pest control organisms thus negatively affecting the complexity of the biological interactions occurring in resilient ecosystems.

Different dimensions of Diversification and African indigenous vegetables (AIVs) as a concrete illustration of the diversification pathways for the sustainability of local food systems

One keyway to foster sustainability in food systems is diversification.

Part of this can be done through supporting the production, marketing and consumption of the AIVs. Indeed, if better integrated in the

food systems, they offer important features in terms of nutrition, use of natural resources and farming inputs, thus increasing agro-biodiversity and climate resilience.

Essentially, the ‘diversification pathway’ is a strategy for improving diets based on widening the range of food produced by farmers and available to consumers. By maximizing multiple outputs instead of maximizing yields or production of a single product at the farm level, it reduces the risk of total crop failure by diseases, and/or extreme weather events. Diversification at field and household level can also positively impact: nutrition by increasing home consumption of nutritious and diverse foods; sources of income by selling produce and agricultural production; and women’s empowerment.

A recent IPCC report, which was approved by the world’s governments, states with high confidence that “agricultural practices that include indigenous and local knowledge can contribute to overcoming the combined challenges of climate change, food security, biodiversity conservation, and combating desertification and land degradation.”³

3 “Climate Change and Land. An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems”, IPCC 2019.

Sustainable Agrifood Systems Strategies – SASS project aims to foster diversification as a strategy for more sustainable food systems. Neglected Underutilized Species (African Indigenous Vegetables) represent an opportunity for promoting diversification.

DIVERSIFICATION
as a strategy for agricultural production

Resilience of natural resources
Local techniques and indigenous vegetables have low requirements in terms of natural resources

Biodiversity conservation
The employment of local seeds preserves local biodiversity

Economic empowerment
A strong AIV value chain can generate job opportunity and incomes

Better soil condition
Multiple cropping system enhances lands productivity

Healthier diets
Indigenous vegetables are highly nourishing and safe

Cultural importance
AIVs are a driver for strengthening local food

- *Diversification for climate resilience and the environmental importance of AIVs:*

The results of the study carried out by SASS agronomic researchers showed that, although no direct measurement of greenhouse gas emissions was possible, techniques analyzed in the field (e.g. addition of organic fertilizers) can have a positive impact on

reducing greenhouse gases. Local soils are rich in organic substances and have only been cultivated for a few years, and are therefore already climate resilient. Correct management of this fundamental resource is essential for these characteristics to be preserved.

Furthermore, the local scale availability of floral resources provides positive effects on the pollination ecosystem service, allowing for more stable ecosystems and increased agriculture yield and nutritional value of the produced fruit.

The traditional multiple cropping system (or polyculture) practiced by small farmers is a diversified farming system where grains, fruits, vegetables, trees, fodder, and animal products are produced on the same field. When coupled with conservation agriculture practices (e.g., no tilling, low water input, avoidance of agrochemical products), this kind of systems protects the local biodiversity, not only in term of species, but also concerning their useful interactions (e.g., pollination, pest removal and seed dispersal).

- *Diversification for preserving biodiversity*

Plants such as indigenous vegetables, with low requirements in terms of natural resources (soil, water) and farming inputs, are suitable to increase agro-biodiversity. Moreover, the smallholder farming practices represent a valuable element in terms of environmental sustainability. For example, the employment of local seeds on the behalf of local peasants is very important in preserving the local functional biodiversity and counter the

homogenization of food varieties even more in semi-arid environments with irregular or low rainfall that characterize many areas of African food systems, e.g. in Tanzania.

Through a microbiological analysis of food, SASS researchers were also able to experiment with a fermentation process of AIVs (especially broadleaf AIVs such as Amaranth), with a positive effect in terms of durability and thus food safety. The key concept of fermentation is to exploit and enhance biodiversity to improve durability, safety and increasing the presence of specific useful nutrients.

- *Diversification for healthier diets*

Indigenous vegetables represent a good source of macro and micronutrients. Legumes such as *Vigna subterranea*, *Vigna unguiculata*, and *Tylosema esculentum*, are high in proteins and essential amino acids, ranging from 22 to 35 g of proteins per 100 g. It is also noteworthy that some minor cereals (eg, sorghum, finger millet, and teff) diffused across sub-Saharan areas are excellent sources of protein (8-13 g/100 g of product).⁴ Moreover, *V. unguiculata*, *Bidens pilosa*, *Justicia flava*, *Senna occidentalis*, and *C. gynandra* could be regarded as an alternative source of complex carbohydrates with low glycemic index. The indigenous vegetables also represent a source of iron, calcium, zinc, vitamin A, vitamin B9, vitamin C.⁵ The daily consumption of indigenous vegetables could increase the dietary diversity of the African population—facilitating the achievement of the recommended nutrient intake and reducing the risk of developing a nutrient inadequate intake, therefore also reducing the risk of food insecurity.

4 Conti, M. V., Campanaro, A., Coccetti, P., De Giuseppe, R., Galimberti, A., Labra, M., & Cena, H. (2019). Potential role of neglected and underutilized plant species in improving women's empowerment and nutrition in areas of sub-Saharan Africa. *Nutrition reviews*, 77(11), 817-828.

5 *Ibidem*

- *Diversification for economic empowerment:*

Food value chains should be well-organized and efficient, so as to meet nutritional needs in an economically viable manner over time, including an adequate provision of jobs and incomes. AIVs have a strong potential to do that, especially through women's economic empowerment as women often cultivate, process and market the indigenous vegetables. As literature shows, agro-pastoral diversification has constituted an ancient coping-strategy in facing cyclical decreasing rain and risk of famine, that has led to a high social value of cattle. This remains as one of the strategies for low-income groups in rural areas in stocking capital and wealth that can be saved and mobilized to buy grains for the year when harvest is scarce.

- *The cultural importance of AIVs*

The cultural aspects related to AIVs are crucial because, from a consumption point of view, their demand is erratic. This is due to the limited consumer awareness on their benefits, some issues of food safety (real or perceived) and a related lack of trust, issues of origin and related "sticky" consumer preferences and of lack traceability. In rural context AIVs are historically diffused, as part of local diversification strategies as much a main side-dish to enrich ugali, and are linked to patterns of local knowledge of local environments and plants, with specific character of belonging and culinary traditions.

The scientific terminology of AIVs, and often the terminology utilised on a national level in African countries, do not coincide with local names and perspectives, since local taxonomy and nomenclature follows other criteria than "crop varieties", such as culinary aspects of women's knowledge. In view of local participation and involvement, it therefore becomes crucial to start from local "names" and perspectives of AIVs, with their associated cultural patterns in marketing, informal and formal

networks, patterns of local cooperation and exchange—which otherwise would be at risk of overcoming or being lost.

- *AIVs potential and challenges*

Many of the challenges regarding the production, distribution, processing, and consumption of AIVs relate to lacking information and missing coordination and synergies. The potential lies in the many opportunities that AIVs can give to the small farmers and to all the local population, such as, i) the encouraging results in terms of the nutritional content of derived products; ii) the possible amelioration of the economic conditions of farmers through the potential that increased market demand offers to move away from production for self-consumption; iii) they are characterized by a wide variety and are highly nourishing; iv) they are adapted to the local climate and, therefore, more readily available; v) their production can increase business collaboration and alliances between actors involved in the value chain.

Chapter 2

The SASS emerging results: pathways towards more sustainable (local) food systems

This SASS final report aims at describing the approach adopted during the project and the results of two years of interdisciplinary research and dialogue activities in Kenya and Tanzania; concerning the diversification pathways to reach more sustainable (local) food systems. A sustainable food system is a food system that provides affordable, healthy, nutritious food for all, according to environmental, social, and economic sustainable principles. In its efforts to contribute to more sustainable food systems, the SASS project also became a platform for learning and exploring how to use a “food systems approach” that is increasingly recognized as the broad conceptual framework to consider the whole food system and for interdisciplinary research and dialogue into the complex dynamics of food production, distribution, processing, knowledge, consumption and governance.

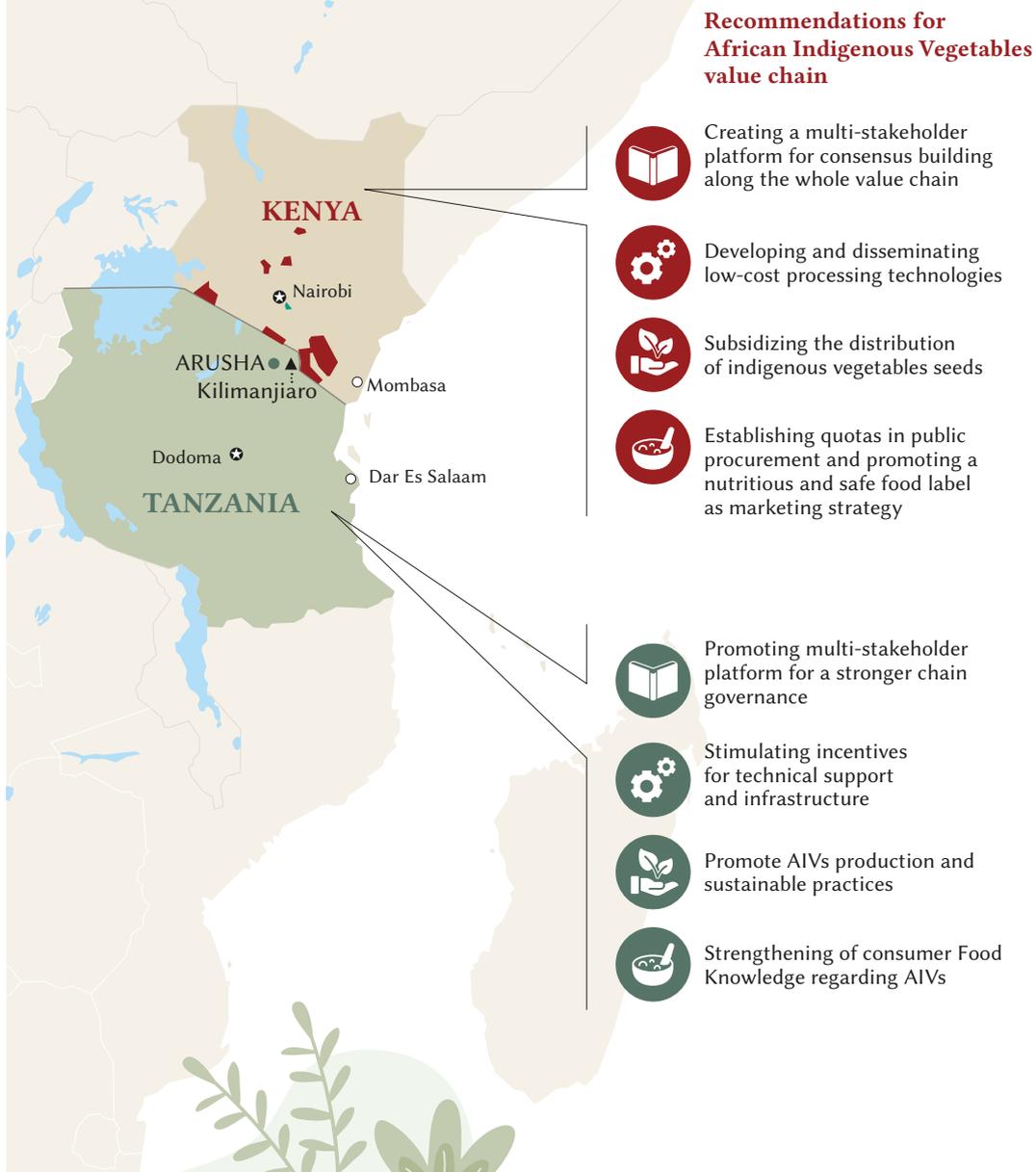
Researchers, policymakers and practitioners can use a food systems approach to identify and address trade-offs between different sustain-

ability objectives, and to capitalise on opportunities to accomplish multiple objectives simultaneously, towards the SDGs. By providing a ‘big picture’ view, a food systems approach can inform better practices and policies and facilitate improved policy coordination and more effective collaboration with food system stakeholders. Indeed, the SASS Project involved all relevant local actors, including small farmers, in the research and dialogue activities and in the preparation of the proposed pathways.

Emerging results for improving the AIVs’ value chain

Both in Tanzania and in Kenya, SASS aimed at identifying pathways to improve the production, distribution and processing, consumption and governance within AIV value chains, while always trying to link all these elements together into a food system thinking and approach.

Given the opportunity represented by the African Indigenous Vegetables for improving the sustainability of the food system, some recommendations emerged from the fieldwork for enhancing the AIV value chain.



The Tanzanian case

- *Production:* The SASS research suggests that developing an indigenous vegetable-sensitive curriculum for extension officers can promote indigenous vegetable production, decrease production risks, and spread sustainable production practices, particularly for the small farmers. Arusha and Meru District agricultural officers are the main actors in this pathway since they disseminate the information about indigenous vegetable production practices. The outcomes of SASS can contribute to supporting a coalition to lobby the integration of sustainable indigenous vegetables production practices and by informing farmers about sustainable production techniques of indigenous vegetables.

This should be linked to the awareness of local knowledge, local moral economy and taxonomy, in short, local perspectives in producing, using, marketing AIVs, which otherwise would be excluded. As example, in semi-arid areas, important leafy vegetables are harvested at the end of the rainy season, then are sun-dried and house-stored afterwards. They are hardly found at the marketplace and are often exchanged without money, through barter or exchange systems, while composing not only crucial diversification practices, but also strong identity and territorial connotation of specific dishes. The use of dried leafy vegetables is a peculiarity of agro-pastoral populations of semi-arid areas characterized by frequent periods of food shortage where crops must rely on an increasingly erratic rainy season.

- *Distribution and Processing:* Unsafe food along the indigenous vegetable chain is due to weak enforcement and coordination combined with insufficient technical support and infrastructure, and a lack of incentives for investments in safer practices at the farm and the market levels. A price premium for quality assurance can be used to finance the necessary investments.

SASS-derived policies could also support the design of food safety programming by facilitating the inclusion of a wide range of stakeholders (such as MVIWATA, the national network of farmers' groups, Tanzania Horticulture Association (TAHA), a member-based private sector organization) into a multi-actor platform about AIV to be embedded within Arusha's City Council and its food strategy, e.g. through a specific food safety task force of such platform .

Fresh vegetables are grown in areas close to water sources, while where water is available only during the rain season these crops are not available throughout the whole year. The ongoing "replacement" of traditional dried IV with the fresh vegetables is not regarded as a nutritional improvement factor only, but rather as a change involving many social and communal dimensions. An increase in the production of the so called "fast crops", also known as cash crops (i.e. tomatoes, cassava and maize, sunflowers, vegetables in general), which replaced food crops (mainly millet, sorghum, peanuts), is pushing to neglect crops for food survival. Policies pushing the diffusion of fresh mboga should avoid limiting the extent of the knowledge of self- production and self-consumption of sun-dried AIVs (mboga) at the household and the village level. Sun-dried leafy vegetables are an important part of these resilience strategies in times of serious drought. Smallholder commercialization under certain circumstances may induce and exacerbate food insecurity because it brings a fierce competition for household resources, as more inputs are diverted from food crops to cash crops production with a subsequent change in dietary intakes.

- *Consumption:* Strengthening of consumer FK regarding indigenous vegetables, including benefits and proper cooking techniques, could improve the consumers', such as small farmers, choice and help to tackle the problem of malnutrition. In addition, to investigate the starting level of the FK, before carry-

ing out a nutritional education intervention, is fundamental. In fact, some literature results showed a correlation between a good FK level and an increased dietary diversity and adequate intake.

Furthermore, monitoring the starting level of FK allows it to carry out strategies both at the policy - governmental level and at the individual level, so that it is more targeted and effective. Therefore, SASS project⁶ built and validated the FK questionnaire for Tanzanian childbearing age women that represents a screening tool aimed at local healthcare professionals.

To increase dietary diversity and FK could lead to dietary adequacy improvements, it is therefore important to identify the starting situation to build a targeted intervention.

Possible ways to provide nutritional information include national food-based dietary guidelines, local programs for schools, specific cooking techniques in workshops, and local campaigns tackling cultural practices that limit dietary diversity.

- *Governance*: An Arusha multi-stakeholder platform for the indigenous vegetable chain can facilitate stronger chain governance and learn from, or build upon, existing multi-stakeholder initiatives. The key stakeholders should include local facilitators, knowledge generators and fundraisers, financial institutions, smallholder farmers associations, local government officials, champion farmers, traders and processors, partners involved in existing sustainability projects and in horticultural export chains, local traders' organizations or networks, and consumer advocates.

The Kenyan case

- *Production*: The SASS research and dialogue activities allowed to propose a set of recommendations. First, it is crucial to im-

⁶ This activity was led by the Laboratory of Dietetics and Clinical Nutrition (University of Pavia)

prove the legislative framework to foster the indigenous vegetables' seeds system. Second, the Ministry of Agriculture could subsidize the distribution of indigenous vegetables seeds , including through piloting the use of vouchers for farmers. Third, interventions to increase the productivity of indigenous vegetables are needed, such as the promoting of better production management and techniques, the tailoring of public investment strategies targeting the need of indigenous vegetables value chains, and the supporting of the smallholders to enter fair contractual arrangements with indigenous vegetable market actors.

- *Distribution and Processing:* Economic research and policy dialogue activities pointed to the importance of designing and implementing incentives for informal transporters and traders, the majority in Nakuru county, to stabilize the distribution system for AIV, in cooperation with smallholders and building upon the effective distribution networks for more commercial and export-oriented vegetables. SASS also developed a dedicated research stream to analyze and recommend improvements in preparation, preservation, and processing techniques of fermented indigenous vegetables. An enabling regulatory framework to incentivize processing is needed. Technology-based solutions are also important to develop and disseminate simple and low-cost processing technologies that can benefit small farmers and entrepreneurs as well as larger agribusiness development.
- *Consumption:* The government can support the increase of AIV consumption by establishing quotas in public procurement, such as school feeding, hospitals, and army schemes, for the purchase and provision of indigenous vegetables. A regulatory improvement could be the launching of a multidimensional label for indigenous vegetables, indicating production practices, origin, fair practices, food safety, nutritional value, and

environmental impacts, to overcome consumers' trust issues. The establishment of such labeling schemes should be accompanied by origin-based marketing strategies for smallholders and "participatory guarantee systems" to effectively involve farmers, consumers, intermediaries, and other value chain actors. Finally, smart communication campaigns about the health benefits should be launched via national and local media.

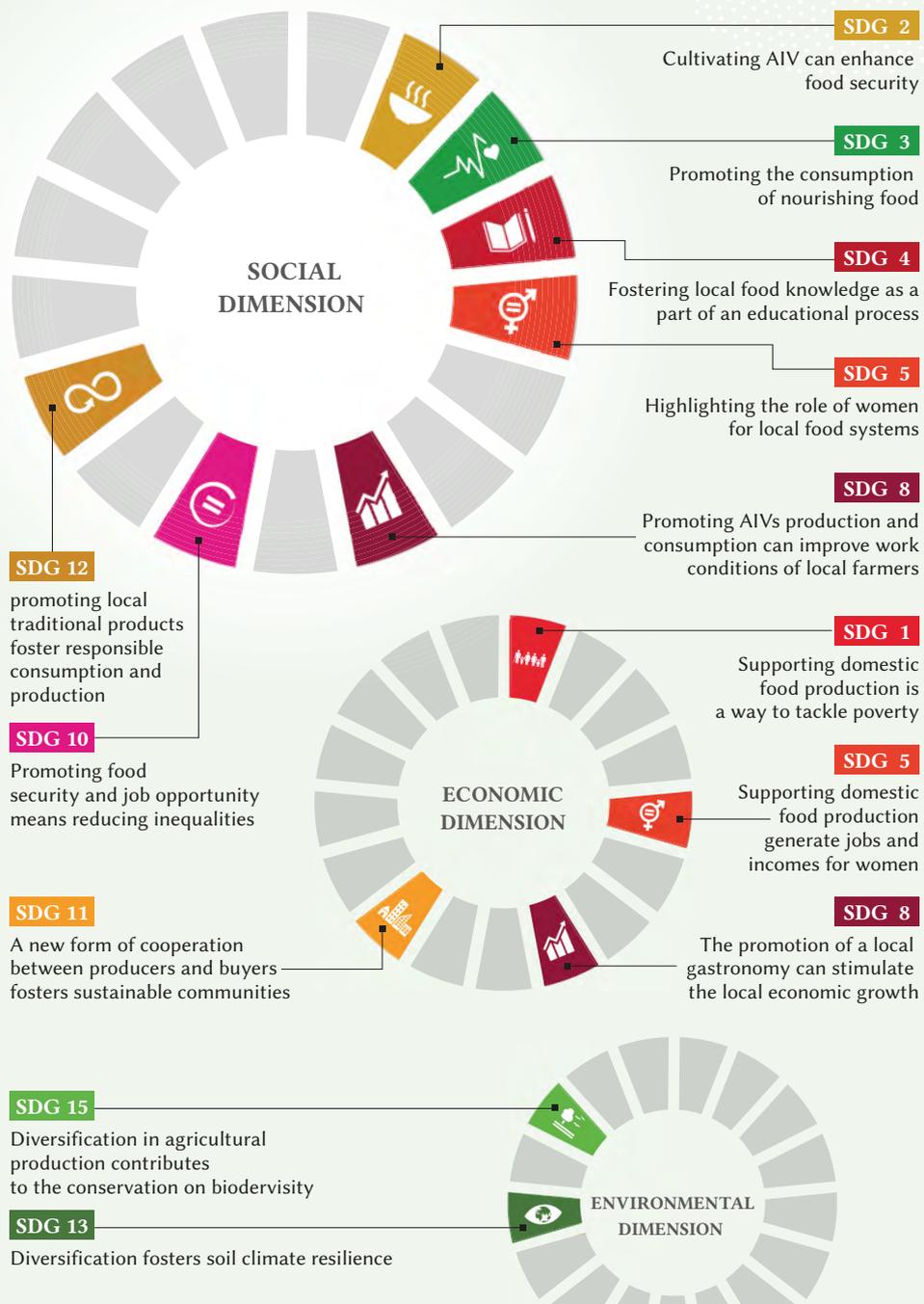
- *Governance*: Many of the bottlenecks to improving the production, distribution, processing, and consumption of indigenous vegetables relate to lacking information, missed coordination among stakeholders, and missed synergies between different dynamics, policies and investments in different parts of the food system. For this reason, a multi-stakeholder platform dedicated to these vegetables can improve coordination, consensus-building and information sharing along the whole value chain, including by making better linkages between AIVs and other parts of the food system. This would include for instance exploiting in a coordinated way the opportunities to link AIV and maize (a key crop for all Kenya) at production, processing and consumption level: AIV and maize can grow together, both through rotation and intercropping on the same plot; can be mixed through flours to produce refined food; and are most often consumed together in the same dish .

Chapter 3

The sustainability of local food systems and the SDGs

The emerging results from the research and dialogue activities of SASS could not only support the strengthening of AIV value chains and the development of more sustainable local food systems, but also contribute to improvements towards several of the SDGs.

Diversification of both production and consumption, and the improvement of African indigenous vegetables value chains, can contribute to the promotion of sustainable food systems and to the achievement of Sustainable Development Goals.



Social dimension

The social sphere of the SDGs includes building towards gender equality (SDG5), decent work and economic growth (SDG8), zero hunger (SDG2), good health and well-being (SDG3), reduce inequalities (SDG10) . The emerging results from the research and dialogue activities of SASS point to pathways and solutions that can contribute to these SDGs, through different types of improvements.

The gender aspect is very important since both Kenya's and Tanzania's food systems strongly rely on the female workforce, and, in both systems, women are usually excluded from land property and capital access.

Although apparently patriarchal societies, women play a fundamental role as a pillar of those food systems. Women are the primary caregivers in sub-Saharan Africa, they impact their children's nutrition indirectly through their own nutritional status as well as directly through childcare practices. Moreover, women are linked with food knowledge because they take care of the family, prepare food, and plan for their household's dietary intake. Besides, women are also involved in small agriculture and in selling and processing surplus in local markets and social networks. Therefore, interventions against malnutrition problems need to start from the knowledge, attitudes and dietary practices of women in different families.

Moreover, the pathways suggested by SASS for diversification of production and consumption of crops, in contrast to the homogenization trends prevalent in most regions of the world could have positive results in terms of healthier diets, as well as decreased risk of crop failure by diseases and/or extreme weather events, increasingly frequent due to climate change.

Also included in the social sphere, the results of the SASS project have identified increasing freedom of choice and upholding identity values of the local communities, especially amongst young people, as possible important contributions to attaining quality education (SDG4) and responsible consumption and production (SDG12).

Environmental dimension

The benchmark SDGs in relation to environmental sustainability are number 13 (climate action) and 15 (life on land). In the territories considered, it was evident from the SASS analysis that climate change is manifesting itself mainly in terms of the distribution of rainfall, which has become more irregular, with both longer dry spells and shorter, more intense rains, significantly affecting harvests.

Small farmers' agricultural practices (e.g., agroforestry, intercropping, conservative farming) analysed during field investigation represent a great element of environmental sustainability. Through the employment of local seeds, local peasants can preserve local biodiversity and counter the homogenization of food varieties. This issue, together with the aspects related to the conservation of plant and animal biodiversity supported by sustainable farming systems (i.e. smallholder farming is highly correlated to conservation agriculture), has been identified in the SASS project's emerging results as a potential support to the achievement of SDG 15 (life on land). Moreover, the research found that the efficient use of available natural resources and the effective contribution to maintaining and restoring diverse natural ecosystems also make food system activities more resilient to climate change.

Economic dimension

The sustainability of the food system is closely linked to SDG 1 (no poverty). With a view to possibly contributing to achieving this SDG, the SASS project has shown that in certain cases, for instance in certain parts of Tanzania, less dependency on the market can have positive effects on poverty reduction, by providing support for domestic food production and allowing households to be more resilient. These forms of domestic food production can essentially function as a cushion against extreme poverty in communities.

Under the right circumstances, on the other hand, diversification of production and markets can support the improvement of smallholders' incomes, especially in Kenya with more efficient AIV value chains and better access to markets. Emerging SASS results highlighted that an efficient and well-organized food value chain based on smallholder agriculture capable of meeting nutritional needs in an economically viable manner over time is possible. Throughout this value chain, adequate provisions for jobs and incomes, particularly for women, are essential for also attaining SDG 5 (gender equality). Although in many cases, the SASS project has found that smallholders' value chains are very fragmented due to the lack of adequate refrigeration and storage systems. This fact often leads to a great loss of products: this is one of the reasons why the market has developed on more durable products (e.g. potatoes, cabbage, carrots etc.).

Through its analysis, the SASS project has found that cooperation between producers and buyers can play an important factor in accomplishing SDG 11 as well (sustainable cities and communities). When it occurs, this cooperation assures high levels of sustainability for both parties. In fact, traders can help farmers in planning the production to realize higher profits for both parts and reduce food waste. Both horizontal and vertical cooperation along the food chains is very important. The SASS research identified both forms in the surveyed farming systems, contributing to easier market placement of products, and therefore making the food system more suited to achieving the SDG 8 and the SDG 10 (reduced inequalities).

Moreover, an interesting aspect of reducing energy costs for small farmers, while also positively impacting climate change, is the frequent use of solar energy (the ultimate renewable energy source).

Finally, related to local products, an aspect of great importance is that of their adaptive capacity. Local products can effectively support the resilience of agriculture to external shocks, such as an economic crisis (e.g. 2008-2009 financial crisis), an environmental shock (e.g. change in the distribution and intensity of rainfall), a health crisis (e.g. Covid-19 pandemic).

Chapter 4

The SASS approach: legacy and the value creation

Food systems can be understood by taking into account the frame of accelerated environmental changes and degradation and pandemic risks. Policymaking needs a transdisciplinary perspective that allows the integration of other ways of conceiving a viable future. SASS activities have shown how AIVs can be a crucial entry point in studying and promoting sustainability within food systems. SASS has pointed out the importance of being present in the territory by building networks at different levels, involving local stakeholders, including local government, and international actors. The results of the SASS project have shown that to enable actual food system sustainability, a bottom-up approach involving local actors, with their cultural perceptions and perspectives, is not just beneficial or desirable but essential.

Valuable aspects of SASS have included: 1) the creation of networks among universities, research centres, NGOs and local governments; 2) follow-up activities, including local dissemination of the research results and the tools created by the project to the population; 3) the multi-disciplinary nature and participatory approach, that was specifically innovative in the context of academic research in Italy.

In this sense SASS results could also indirectly contribute to SDG17 (partnerships for sustainable development).

The contribution of the SASS approach also relates to concerns Goal 17 “Partnerships for the goals”.

Partnerships have been a key element for the research and also represent the legacy of the project.

Creating networks

Networking among universities, research centers, local and international organizations, and NGOs led to provided scholarships for local researchers, research collaborations, and intense engagement of local stakeholders.



Multi-disciplinary approach

A team of biologists, agronomists, microbiologists, botanists, economists, sociologists, medical doctors, nutritionists and anthropologists.

Food Systems Approach

A conceptual framework for sustainable food system transformation based on the interconnections among food system, sustainability, political economy analyses and local stakeholders engagement.



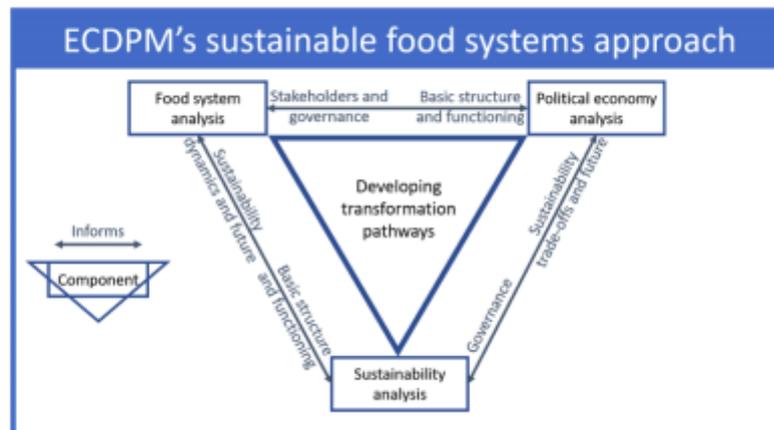
Legacy and value creation: for an innovative food system approach

The creation of networks, both at international and local levels, is necessary, as indicated by SDG 17 (partnerships for the goals), in order to pursue all the other objectives of the Agenda 2030. Efficient governance implies that agrifood systems and frameworks must be administered by a network of local actors who recognize local resources and can effectively manage them. SASS operated in line with the principles of responsible research and innovation (RRI) that support societal actors (researchers, citizens, policymakers, business, third sector organisations, etc.) to work together during the entire research and innovation process. This was done to better align both the process and its outcomes with the values, needs and expectations of society.

Multidisciplinary and participatory approach indeed, and in particular the food system approach (FSA), is the conceptual framework utilized by the SASS team for research and dialogue activities aimed at contributing to sustainable solutions for local food systems. Through trial and error - learning and exploring how to use a “food systems approach” - the SASS project also pointed to a particular framework that could possibly be replicated after the SASS project, as a guide to the food systems approach in practice. As shown in the figure below, the four components recommended by SASS for a “sustainable FSA” are⁷: 1) food system analysis (understanding the food system elements, drivers, and interactions); 2) sustainability analysis (understanding current sustainability dynamics and reflecting on future sustainability challenges); 3) political economy analysis (understanding the governance of the food system). The combination of these three analyses allows to design 4) the development of transformation pathways to advance food systems sustainability with local stakeholders, presenting targeted and politically feasible options to increase the sustainability of the studied food system.

⁷ <https://ecdpm.org/wp-content/uploads/Food-Systems-Approach-In-Practice-Guide-For-Sustainable-Transformation-ECDPM-Discussion-Paper-278-2020.pdf>

ECDPM's sustainable food systems approach



Legacy and value creation: towards a more sustainable and inclusive local food system

Transformation towards more sustainability will require new tools and methodologies, as well as collaboration between various stakeholders, including national and subnational governments, development agencies, civil society, grassroots organizations, global institutions, and so forth. The focus however should always be on solutions that are co-created at the local level under the leadership of local actors since only these can stimulate the economic empowerment of local stakeholders, especially small farmers, and can depart from local perspectives, including the 'social life of food'. In particular, a return to a more widespread use of AIVs would strengthen the local food system, making the local population more resilient against external shocks such as the pandemic which has so dramatically affected the world. Indeed the SASS research has shown the importance of starting from the grassroots level and the crucial role that traditional food can play in facing food challenges and the transformation of society.

SASS concludes that "sustainable agrifood systems strategies" (as in the title of the project) cannot be implemented via "big-bang" solutions. Rather these strategies should be a combination of soft policies, incremental pathways and locally-based solutions owned by local

stakeholders; e.g. a quick formalization of AIV value chains can increase market access hence incomes, but risks benefitting commercial farmers only and disrupting livelihoods of the many informal middle-men . Within this framework, the SASS projects represent just a ‘supporting actor’ or process and one that can aid with forming policy proposals. SASS recommends the “localization of the SDGs” as an underlying bottom-up philosophy for any initiative for sustainable development. In fact, SDGs, international cooperation, and scientific research cannot be solely, or even predominantly, top-down processes.

In order to utilize the SASS experience as a framework, or model, for future similar initiatives, it is important to focus on the different narratives and terms around “sustainable food systems”. For instance, “sustainability” can no longer be discussed in a vacuum, it should also be addressed alongside “resilience”, to climate, pandemics, and other shocks. Further, scientific definitions such as “Neglected and Underutilized Species” in reference to AIVs could be questioned, as these vegetables form part of local food heritages and are not necessarily so ‘underutilized’. Finally, new concepts and practices emerge over time, and could in certain cases be better to tackle the sustainability of food systems; this could be the case of the “One Health approach” in food systems—which is fundamental to improve the health not only of humans but also of animals and plants.

Chapter 5

Challenges and Opportunities: the current scenario

Natural resources are scarce and the effects of climate change and the 4F crisis (fuel, food, fiscal and financial) are increasingly showing up. Transformative adaptation in food systems is needed – that is, broad, fundamental, systemic changes in food production, processing distribution, and marketing systems. Such transitions and transformative adjustments are particularly urgent in African countries for adapting agriculture to climate change, where support will be needed especially for smallholder farmers, who typically have the least resources to cope with great shocks.

The spread of the covid-19 pandemic in these contexts has exacerbated existing critical issues related to agro-food chains. Examples of issues on which the pandemic has certainly had compounding negative effects are the limited market information throughout the fresh produce, often informal, value chains such as indigenous vegetables; and the difficulty to access certain producers and markets, including due to the lack of aggregation centers for smallholders' products.

Climate change, environmental changes and also the pandemic pushed at the center of research and public discourse worldwide the relatedness of the environment with societies and the urgent need of relations of care and reparation.

Challenges

- *Covid-19: The increasing importance of security/safety issues for the resilience of a healthy local food system and the risk related to a superficial analysis on it.*

The covid-19 pandemic has sharpened the issues that were analysed in the SASS research. Yet it is precisely for this reason that the possibility of implementing the project in the future, or replicating it in other contexts, becomes ever more necessary.

Covid has also skewed the conversation to security and safety, which is both a challenge in view of a risk of simplicity/bias and an opportunity to capture everyone's attention, more effectively than before, to the importance of food systems.

Countries like Kenya and Tanzania, with such acute endemic weaknesses related to the population's access to sufficient food, found themselves even more vulnerable when the pandemic impacted local and international food chains. Against the backdrop of climate change and accelerated environmental changes, the pandemic has pushed the centre of research and public discourse worldwide—and particularly in Europe—to the interrelatedness of the environment with societies. Specifically, a focus has developed concerning the urgent need of relations of care and reparation and of viable futures—of which the viable future of food is a major focal point. Socially, the need to integrate cross-disciplinary models of understanding change, where the care for environmental relations remains at the fore, is a major challenge.

The specific difficulties brought by the pandemic in these areas are related to the food market, but also to the reconstruction

of the food system. For instance, in areas where international tourism was very important, such as parts of Kenya and Tanzania, several restaurants have closed down, so it is essential to intervene in order to reformulate the ways to support the local food system, taking into account both the needs of locals and those related to tourism.

Finally, it is necessary to consider that the solutions to be adopted for the complexities aggravated by covid-19 should not be 'blueprints' or 'one size fits all', but rather consist of the promotion of gradual , step-by-step, approaches.

- *It is important to balance social and environmental sustainability in local activities and practices.*

The notion of sustainability is crucial, it composes a common vocabulary and set of indicators, but it cannot be used as a passe-partout notion: it involves many tradeoffs and double constraints. There is a need for concepts that are effectively far-sighted, able to involve environmental relations, changes, care and research and their different local and global perspectives.

Both social and environmental sustainability are necessary to each other and very important in: the promotion of an effective, equitable gender-inclusive engagement of locally available human resources, as well as the protection of health, social cohesion, security, freedom of choice and identity values; and the encouragement of efficient use of available natural resources and the contribution to maintaining, or where necessary, restore diverse natural ecosystems, including ecosystem services and climate resilience of food system activities.

Finally, in this context, the figure of the small farmer as a holder of local knowledge is crucial. Indeed, this can help balance the two dimensions of sustainability mentioned above, particularly through the implementation of policies that strengthen small

farmers, including at the level of production, which remains a key aspect of food security.

- *Sustainability for whom? The importance of a general overview for understanding the implications of sustainability actions and their consequences.*

After the outbreak of the covid-19 pandemic, it has become even more necessary to tackle the question of ‘sustainability for whom’, since the concept of sustainability alone seems outdated. In this sense, sustainability in the African and European contexts mean different things. In the African territory, for example, one can look at sustainability through the paradigm of making its short value chain more resilient to the shock of the pandemic; while for Europe, one could look at the sustainability of its longer value chains which came to a relative standstill during the pandemic.

Indeed, acknowledging and understanding the various tradeoffs between the different sustainability’s dimensions is fundamental, since strategies implemented to safeguard socio-economic aspects of sustainability are not necessarily compatible with those needed to preserve environmental sustainability, and vice versa. For example, while facilitating and encouraging the economic participation of local actors through certain practices, these may have negative impacts in terms of waste in the logistics of food transport, and therefore also in terms of wasted energy. On the other hand, environmental protection does not automatically imply an improvement in the living conditions of local workers or an acceleration in the growth of the local economy. Thus, while each type of sustainability is necessary for the other and closely interrelated, it is equally true that the possible negative effects that one can have on the other must be determined, and hopefully mitigated.

Opportunities

The SASS research showed that, if effectively managed, agrifood systems can indeed guarantee sustainability. The need to implement a transition towards economic, social, and environmental sustainability of the food system is a “natural” consequence of the 4F crisis (fuel, food, fiscal and financial). In other words, awareness had ripened on how food system governance should start from knowledge and the effective management of local resources (tangible and intangible), underpinned by activating the local network of actors. This type of food system governance focuses on steering food quality, promoting local production, so as to limit transport costs (and thus reduce carbon emissions), organizing campaigns to raise awareness on healthy eating and foods with low environmental impacts, and enabling the proper use of lands.

The SASS project has concluded that this transition to a more sustainable global food system is achievable. In fact, the analysis may have contributed in some way to the creation of a basis for the development of innovative food economy sectors that can combine economic, social and environmental sustainability, such as vegetable value chains based on nature restoration and the production of nutritious, climate-resilient and women empowering products, both for international trade and local markets. It is therefore hoped that, building on the research and suggestions of SASS, an entrepreneurial strengthening of the local food economy in Kenya and Tanzania could spearhead the sustainable growth of AIV value chains and the improvement of local livelihoods.

Both methodological approach and the findings of the project offer opportunities in terms of future research avenues and actions towards a more sustainable food system, a more sustainable planet and a more sustainable community.

OPPORTUNITIES:

Interdisciplinary research

Both interdisciplinarity and integrated approach are strategic for facing the complexity of challenges.

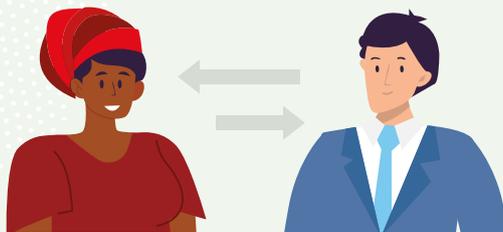


Mutual learning-sharing knowledge

The similarities of conditions between the examined areas and others, e.g. in the Mediterranean, allow to replicate sustainable practices.

Local knowledge for SDGs-promotion and innovative systemic approaches

Fostering local knowledge is a key opportunity for the achievement of SDGs. Improving local food knowledge means improving awareness about the role of local resources for promoting sustainability.



A shift of focus from a top-down dissemination to the co-creating of innovation processes

Shifting from the one-way transferring knowledge approach, to a participatory process for sharing and promoting food-related innovation.

Resilient food systems against external shocks

The adaptive capacity of a sustainable local food system can support the resilience of agriculture to external shocks such as global economic crisis, environmental crisis and climate change, and pandemics.



- *Mutual learning*: While many in Italian academic circles and the wider public still seem to believe that learning can only be done in a unidirectional way from Italy, or Europe, to Africa, the results of the SASS project has shown that this is not the case. Through dialogue with African partners, it is possible to learn and replicate good practices about sustainable production, processing, consumption and governance processes also for the benefit of food systems in Italy . SASS researchers have identified some similarities between the examined areas in East Africa and the Mediterranean region, such as: water shortages, climate conditions, crops, simple and traditional farming techniques. Thus more intense sharing of knowledge generated by SASS with African partners can be useful also for replicating similar research and dialogue activities in the Mediterranean area.
- *The importance of differentiated approaches for facing the complexity of current challenges* and of out of the box development cooperation. Each food system has different characteristics and therefore a unique pathway towards sustainability. Unearthing the characteristics and trade-offs of sustainability pathways in food systems needs interdisciplinary research, which can lead to the design of context-specific programs and policies in partnership with and owned by local actors. Accordingly, development cooperation activities to support improved sustainability of food systems in Africa should be ‘out of the box’ and more effectively aligned to local contexts, concerns and ideas compared to standard international assistance.
- *The linkages between sustainable development and health*: The emerging results of the SASS project have highlighted the interconnectedness of, and joint drivers for, sustainable development and health: the health of people is closely connected to the health of biodiversity and ecosystems where they live as well as to the capacity of local stakeholders to understand

and manage such links. Therefore the “one health approach” is particularly important and should be receiving more attention from the research communities both in Italy and Africa. Therefore, it is fundamental that the African population improves their knowledge and awareness about the role that local natural resources offer, especially because they represent a sustainable solution both from an environmental and human health point of view.

- *A new focus* : Shifting the focus from top-down dissemination towards co-creating innovation processes can reduce systemic bias and increase applicability, particularly with regards to more marginalized players or crops. This would, for instance, shift extension officers’ roles from agents for the one-way transfer of knowledge to facilitators of an innovation process that identifies problems and opportunities in a more participatory and responsive manner. Furthermore, the SASS project’s preliminary results point to a need for a better local stakeholder knowledge of the SDGs framework, particularly concerning the social and the environmental dimensions and amongst youth and women, to become more aware of food-related issues.

- *Replicating SASS methods in new territories as a toolbox for Food Systems and Participatory Approaches*

The SASS Project has learned from the Kenyan and Tanzanian cases, and from international collaborations, that so many partners stand ready to further facilitate multidisciplinary research, policy dialogue, and partnerships towards more sustainable food systems in Africa, and also in Europe. These initiatives, at different levels, to support more sustainable food systems, identified during the SASS research, can positively contribute to a number of SDGs, including SDG2 Zero Hunger, SDG3 Good Health and Well-being, SDG11 Sustainable Cities and Communities, SDG12 Responsible Consumption and Production, and SDG 15 Life On Land. The SASS team is therefore

committed to explore further partnerships and offer our methods and approaches to be utilised collaboratively in other contexts in the near future.

Project description

The “Sustainable Agrifood Systems Strategies (SASS)” multidisciplinary programme, funded by the Italian Ministry of Research, aims to build knowledge, policy dialogue and partnerships contributing to sustainable food systems at national, regional and international levels, based on three research locations in Kenya and Tanzania. The SASS programme is a consortium initiative by the European Centre for Development Policy Management (ECDPM), the University of Milano-Bicocca (UNIMIB), the University Cattolica del Sacro Cuore (UNICATT), the University of Pavia (UNIPV) and the University of Gastronomic Sciences (UNISG). The aim of the present e-book is to introduce the preliminary research results from SASS, between 2017 and 2019, about the food system in the southern Nakuru area in Kenya.

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