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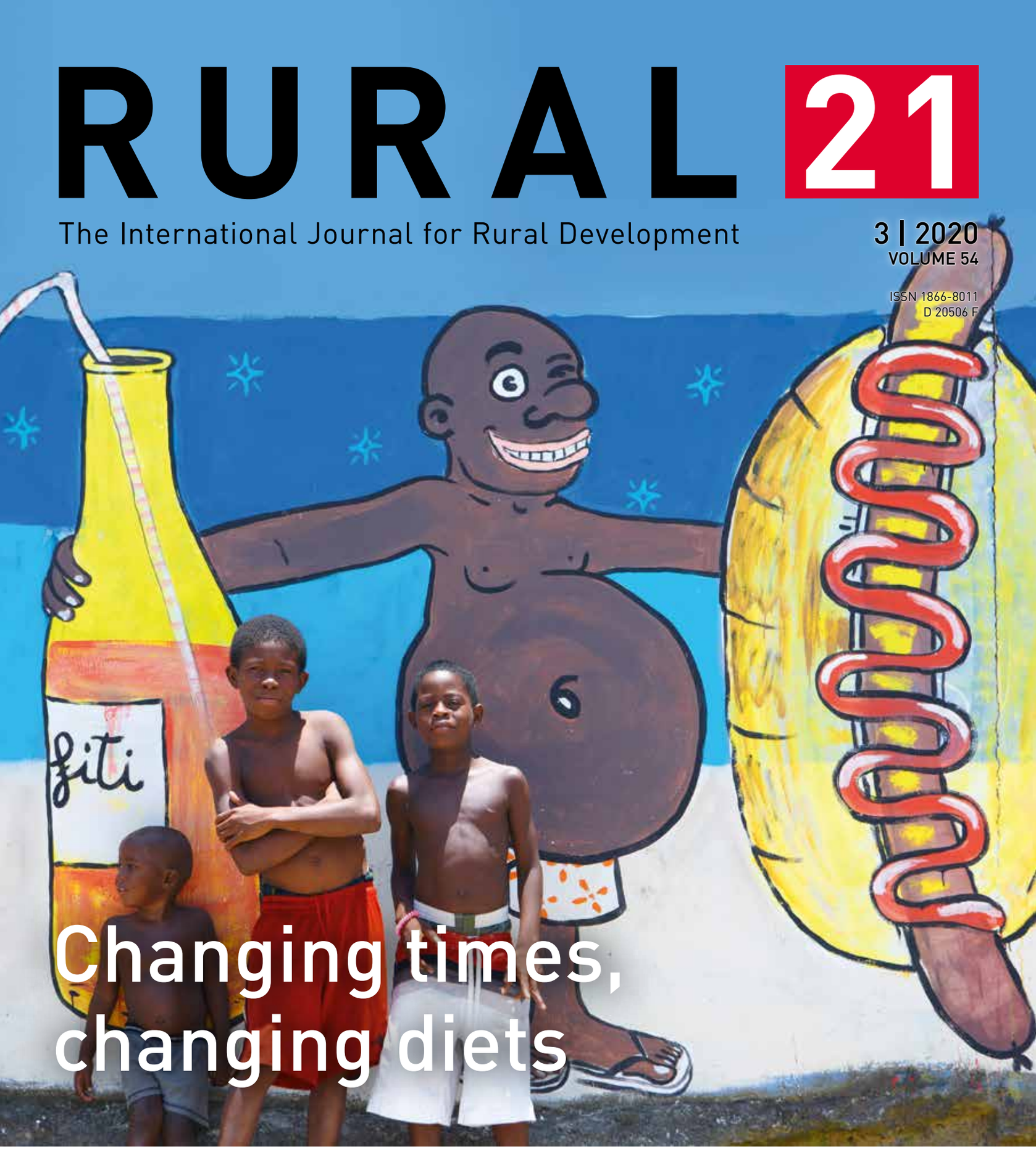


# Changing times, changing diets

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Dear Reader,

Many of you will be familiar with the 2019 publication Food in the Anthropocene, in which the EAT-Lancet Commission described the link between nutritional targets and environmental sustainability. In brief, the study argues that diets and food production will need to change in order to improve health and avoid damage to the planet, emphasising that people will have to eat more fruit, vegetables, nuts and seeds, legumes and whole grains while reducing the consumption of ruminant meat in particular. Setting out from this, the authors presented a proposition for a global reference diet.

Whereas it is undisputed that the recommendations of the Lancet Commission point in the right direction, the question remains how the world population can be urged to take precisely this course. For the recommendations raise a number of tricky issues. First of all, there is the human factor. People's food choices are by no means dictated solely by the aspect of health. What we eat depends crucially on the culture that we have grown up in, the traditions that we maintain and what we believe in. How we prepare our daily meals is determined by factors such as time, cost and availability of food. The latter in turn depends largely on supply chains, markets and trade. And then there are social norms and the degree to which media and marketing professionals influence choice. So many emotions come to play, while rationality assumes a lesser role.

This leads us to the second problematic issue, that of scientific evidence. While studies have revealed that the intake of the food recommended above is inversely associated with the risk of developing hypertension, type 2 diabetes or cardio-vascular diseases, our knowledge of precisely how diets are systematically linked to nutritional adequacy, human health and environmental health remains very limited. We also know little about which policy interventions – be it on the supply or on the demand side – are really suited to govern globalised sustainable food production and consumption systems.

Then there is issue number three: affordability. Even if we assume that the proposition for a global reference diet presented by the Lancet Commission is the right one for the health of the people and the planet as a whole, we still face the problem that nearly 1.6 billion people around the world simply can't afford such a diet. And even if we were to succeed in making healthy food more affordable to all people, e.g. via income transfers, investments in inclusive income growth, increased productivity in agriculture or nutrition-smart fiscal policies, this by no means implies that people will really integrate it in their daily meals. For this brings us straight back to the first issue, the human factor.

As their disposable income rises, more and more people in low- and middle-income countries start favouring the so-called Western style diet – with high amounts of refined carbohydrates, saturated fats, sugar and salt and a high share of processed foods. This in turn results in more and more countries being confronted with the double burden of malnutrition, a phenomenon characterised by the coexistence of undernutrition and micronutrient deficiencies on the one hand and overnutrition and obesity on the other.

So these are complex contexts which call for complex answers. Our authors and interview partners show what level of knowledge we are at and where there is a need for further research. They give examples of how the negative effects of changing consumption patterns can be addressed by multi-sectoral and multi-stakeholder action, but also of the new opportunities that changing dietary habits offer farmers and agripreneurs. And they highlight how traditional but frequently underutilised and undervalued food can contribute to tackling the nutritional problems of the modern world.

We wish you inspiring reading.

On behalf of the editorial team,

Silvia Richter

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# Changing times, changing diets

**Diets are the great equaliser. Depending on who you are, where you live and the amount of resources at your disposal, diets can either hinder or promote human and environmental health. Overall, diets are changing for various reasons, particularly in rapidly transitioning low- and middle-income countries. If trends in these countries follow those in high-income contexts and countries, fragile health systems could be overwhelmed and burdened with a new host of complex diseases. How can low- and middle-income countries leapfrog over the mistakes made in high-income countries and ensure that dietary changes are moving in a direction benefiting both human and planetary health?**

**By Jessica Fanzo and Isabella Sarria**

What people choose to eat and the way they eat and interact with food looks different depending on who someone is, where someone is or where they come from. Despite these differences, food and diets are an essential part of who we are as humans and individuals. The importance of diets begins foundationally, for it is necessary for humans to survive, have energy and perform everyday tasks. Overall health and bodily functions that determine overall well-being are highly dependent on the composition of diets and their adequacy, diversity and safety. But people's food choices are not solely influenced by health. Where individuals and their families originate from influences their culture, traditions and beliefs, which in turn bears on the way they choose, prepare and view food. Traditions and culture,

Photo: Bilderbox.com

in turn, also shape the types of diets that people eat. A person's daily relationship with food is complex and depends on several factors, such as cost, time and availability. Diets are therefore not only a solitary concept, but are instead connected to many parts of life, and understanding those connections is the first step in understanding dietary habits.

Diets also have an interconnected relationship with the surrounding environment and societies. It is a two-way street: just as the environment influences food and dietary choices, the way societies produce, process, distribute and manipulate food affects the environment and natural resources. Landscapes, ecosystems and surrounding environments play a role in the kind of crops and animals grown and raised. In turn, the functionality of supply chains, trade and markets influences the types of foods individuals have access to, and for many countries, this is a significant contributor to economic growth.

## Why do people make certain choices about the diets they consume?

Every individual makes different choices for different reasons regarding food and diets, but some people have more options and more resources when making these choices. Some have a vast array of choices, while others have very few. From money to accessibility to values, people prioritise distinct things when deciding what to eat and the best way to interact with food. Part of understanding why people make certain diet choices therefore requires an understanding of the resources, constraints and aspirations that influence those choices, but also the immediate built and food environments where people live and purchase foods and their influence on food choice.

As people adapt to the environment they are surrounded by, they become limited to only certain food options for which the food supply bears. Ultimately, these choices will be a product of what is available and accessible to them. Accessibility, price, taste and convenience are all aspects of food that influence the diets different people consume. Brands, certifications, advertising and marketing also matter and can influence choice. Factors that influence diets are highly dependent on the incomes of households and the spectrum of development of countries. Rural diets can also be quite distinct and different from urban diets because the types of food vendors and food availability on hand change dramatically with geography. Countries with major cities have greater access to good food options, giving people a larger selection of dietary choices, but at the same time, more exposure to energy-dense foods with limited nutrients.

Customs and beliefs influence what people choose to eat as does knowledge of food and nutrition. Changing social norms and media can influence food purchases. These types of exposures show that people are not only a product of their own individual choice and beliefs in what they choose to eat but are impacted by society and cultural trends.

## How are diets changing?

Over the last decades, diets in low- and middle-income countries (LMICs) have been changing in both positive and negative ways. On the positive side, diets are more diverse in the types of foods people consume that are available in the food supply. Dietary variety is associated with increased dietary quality because it broadens the sources of the vitamins, minerals and macronutrients that fuel and protect your body for optimal human health. There are other positive trends. The intake of trans fats, a type of industrialised fat that is deleterious for health, has declined in some regions of the world. One trend that has both positive and negative implications is that over the last

two decades, in many middle-income countries of Latin America for example, people are eating away from home, in more restaurants.

On the negative side, people are consuming more highly-processed packaged foods, such as cookies, chips, crackers and sweets, which tend to be high in added sugars, sodium and unhealthy fats and low in dietary fibre and nutrient density. These types of foods now comprise a significant share of many diets around the world because they are widely available, cheap and intensely marketed. In many upper-middle- and lower-middle-income countries of Asia and Africa, there has been a significant growth in sales of packaged foods over the last 20 years. In addition to foods, which beverages are consumed is also a health concern. While the number of kilocalories purchased from sugar-sweetened beverages is highest in high-income countries (HICs), many low- and low-middle income countries have had a significant increase in their sales over the last decade. These highly processed foods and sugary beverages have been associated with adverse health outcomes including overweight, obesity, type-2 diabetes and cardiovascular diseases.

The demand for animal-source foods is also increasing in many places in the world, but the types of animal foods and products in demand vary depending on the geography, the culture and religious beliefs, to name a few influencing factors. Consumption of processed meat (those types that are salted and cured) has also increased in all regions of the world. While animal-source foods are typically rich in essential nutrients that promote good health and nutrition, some of these foods are associated with increased risk of cardiovascular disease and cancer. In addition, production of some animal-source foods has detrimental impacts on the environment when consumed and produced at high levels.

## Why are diets changing?

With growing urbanisation, globalisation and trade liberalisation, food systems have become more interconnected, with longer and increasingly complex food supply chains involving many diverse actors who engage across many different links of the chain. Connected food systems offer consumers the possibility to access a basket of diverse foods all year long, expanding their food choices and protecting them against seasonal shortages. Efficiency has been the motto for the global food system: the food supply has been increasing in terms of quantity and quality over the last 50 years, with most countries increasing the energy, protein, fat and food weight of their food supply. Yet in this period, the compositions of countries' food supplies have become more similar to one another and some of the more indigenous, local foods have since been neglected and marginalised.

Trade is and will continue to be important for the diversity of diets in that trade increases the availability of different types of foods, extends the number of days that food products are available and influences the affordability of foods. While trade has moved so many different types of foods around the world, it sometimes does so at the expense of local producers and traditional food systems. In addition, when food and beverage products such as sugar-sweetened beverages and highly-processed foods become cheaper, the consequences could be harmful to human health.

Globalisation shapes food environments – the physical, economic, political and socio-cultural surroundings, opportunities and conditions that create everyday prompts, shaping people's dietary preferences and choices – notably through the expansion of supermarkets and hypermarkets. The rapid spread of more supermarkets as well as fast food restaurant chains to every country in the world influences consumer be-




haviour and food consumption patterns. While the "supermarket revolution" offers consumers a wider range of products at a lower price than traditional retailers, it also can spur significant organisational changes across the whole food supply chain. Furthermore, the revolution is shifting the locus of power and decision-making from farmers and producers to traders and retailers, and from governments to the private sector and multi-national corporations.

Food prices dictate dietary shifts as well. Unpredictable changes in food prices have a significant impact on the poor because they spend a higher proportion – 50 to 80 per cent – of their entire income on food. Poor populations, particularly those living in deeply rural areas, often only have access to mainly cereal-, root- and tuber-based diets, while costly animal-sourced foods, fruits and vegetables are hardly affordable for them. With income growth, consumers are able to diversify and shift diets towards those less dominated by staples, to those that include more fruits, vegetables, animal-source foods and dairy as well as more oil and more processed and packaged foods. Consumer awareness can also generate demand for certain types of foods including certain brands, food safety standards and even higher quality foods that meet certain health and environmental criteria.

## Why are changing diets necessary?

With diets now a top risk factor for morbidity and mortality globally, it is necessary to ensure that the world's population can access and afford a healthy diet. Future dietary transitions are projected to negatively impact human health. This will be felt most in lower-middle income countries, where diets are changing most rapidly. Increasing consumption of fruits, vegetables, nuts and seeds, legumes and whole grains would improve human health in most of the regions of the world.

At the same time, diets will need to be more environmentally sustainable if we are to tackle climate change in a serious way. By 2050, global greenhouse gas (GHG) emissions from food production are expected to increase by 50 to 80 per cent as a result of increases in population size and dietary shifts. Land used to grow food will need to expand to meet those dietary shifts of a growing human population, which will result in additional GHG emissions from deforestation and biodiversity loss, with potential additional stress in sub-Saharan Africa. From the diet perspective, reducing consumption of ruminant red meat in particular in regions where consumption of said foods is above the nutritional recommendations would most potentially provide significant health and environmental benefits.

Choices made by high-income countries in how they produce food and what foods consumers choose to eat will have more severe impacts on those people living in low-income countries who do not have the resources to adapt quickly to the rapid onset of environmental changes stemming from food systems. They are also limited in their options to access or afford healthy diets. In the next decade, we need all hands on deck for widespread, large-scale changes. Governments, business and civil society all have a responsibility to ensure that everyone has access to healthy, equitable foods that provide the greatest benefit for human and planetary health.

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Photos (from left to right):
1-6 Jörg Böthling; 7-8 Bilderbox.com


Photo: Jörg Böthling

Nearly 1.6 billion people around the World cannot afford a diet meeting the standards of the EAT-*Lancet* reference diet.

Photo: Jamie Martin/ World Bank

# Healthy diets – a privilege of the rich?

**A healthy and diversified diet is the best antidote against hidden hunger. But by no means everyone can afford such a diet – quite apart from the fact that there is no uniform definition of it. Our author shows what affordability is like around the world and which approaches can lead to a world free of hidden hunger.**

**By Kalle Hirvonen**

Deficiencies in iron, zinc, vitamin A and other micronutrients can have serious negative health consequences for both children and adults. It is estimated that more than two billion people world-wide suffer from micronutrient deficiencies – a condition also known as hidden hunger because even mild or moderate deficiencies that do not show visible symptoms can be harmful. The risks of hidden hunger are elevated for young children and pregnant women for whom micronutrient needs are relatively higher. The 2008 *Lancet* report estimated that more than one million children die every year because of micronutrient deficiencies. The best antidote against hidden hunger is a diverse diet rich in fruits, vegetables, pulses and animal-source foods (meat, poultry, fish, eggs and dairy).

## What defines a healthy and diverse diet?

But can everyone afford a healthy and diverse diet? Studying this question is made difficult by the fact that there is no universal agreement on what defines a healthy and diverse diet. Earlier research in this area focused on high-income countries and often equated a healthy diet with the one consumed in the Mediterranean region, motivated by the finding that average life-expectancies are higher in that region than elsewhere. Another branch of this work defined healthy diets using national food-based dietary guidelines that provide recommended intakes from different food groups taking into account local dietary habits and food availability. Unfortunately, neither of these approaches is well suited to study this question in many low- and middle-income countries, where the bulk of the world's poor people reside. First, the Mediterranean diet does not align with the dietary habits and preferences in Africa, Asia or Latin America. Second, only a handful of countries in these regions have developed their own national food-based dietary guidelines.

An important development in this regard was the formulation of the planetary healthy diet by the EAT-*Lancet* Commission in early 2019. The Commission was tasked to define a set of diets that limit diet-related disease risks and minimise the environmental harm caused by our food choices. The outcome was a proposition for the world's first global reference diet that is reasonably flexible to accommodate most dietary traditions around the globe. The Table shows the Commission's recommended ranges of intake for the major food groups considered for an adult consuming 2,503 calories/day. Like most national dietary guidelines, the Commission proposed consuming a diverse range of fresh or lightly processed foods while limiting the intake of red meats, sugary products, and saturated fats and oils.

While many experts continue to debate the scientific merits of the EAT-*Lancet* diet, the reference diet opened up new options for exploring the affordability question. In a recent study published in the *Lancet Global Health*, we calculated the cheapest means of meeting the EAT-*Lancet* dietary intake recommendations in the reference diet in 159 countries, together representing 95 per cent of the world's population. Using standardised retail price data collected under the International Comparison Program, we worked out that for the median country, the cost of the EAT-*Lancet* reference diet was 2.89 international dollars based on 2011 purchasing power parity exchange rates. This may not sound a lot, but it exceeds the dollar

1.90 international poverty line set by the World Bank by more than 50 per cent. The true cost is likely to be higher because these estimates do not include costs associated with acquiring and preparing the food – household activities that often fall onto women. Comparing the estimated daily costs against available incomes, we calculate that nearly 1.6 billion people around the world cannot afford such a diet (see Figure). In sub-Saharan Africa and South-Asia, the two regions hosting the most of the world's poor and malnourished people, the estimated cost exceeded the available incomes for 57 per cent and 38 per cent of the population, respectively.

## Making healthy food affordable is not enough

Our research suggests that the world's poor cannot afford a healthy and diverse diet – a finding that has been confirmed by a number of recent country-specific studies from Africa and Asia. So what can be done? First, the large observed disparities in affordability are mostly driven by the highly unequal global distribution of income. Thus, raising the incomes of the poor is a necessary condition for improving diets. Targeted income transfers in the form of cash, food or vouchers can improve diets in resource-poor settings if coupled with effective nutrition communication strategies that nudge households to allocate more of their food budget on nutrition-rich food items. A longer-run strategy involves investments in sectors of the economy that promote job creation and inclusive income growth.

**Content of the EAT-*Lancet* reference diet**

| Food group | Serving/day grams | kcal |
|---|---|---|
| Rice, wheat, corn, and other | 232 | 811 |
| Potatoes and cassava | 50 | 39 |
| Dark green vegetables | 100 | 23 |
| Red and orange vegetables | 100 | 30 |
| Other vegetables | 100 | 25 |
| All fruits | 200 | 126 |
| Whole milk or equivalents | 250 | 153 |
| Beef and lamb | 7 | 15 |
| Pork | 7 | 15 |
| Chicken and other poultry | 29 | 62 |
| Eggs | 13 | 19 |
| Fish | 28 | 40 |
| Dry beans, lentils, and peas | 50 | 172 |
| Soy foods | 25 | 112 |
| Peanuts | 25 | 142 |
| Tree nuts | 25 | 149 |
| Palm oil | 6.8 | 60 |
| Unsaturated oils | 40 | 354 |
| Dairy fats | 0 | 0 |
| Lard or tallow | 5 | 36 |
| All sweeteners | 31 | 120 |
| **Total** | **n/a** | **2,503** |

Source: Willett et al. (2019)

Second, there is also scope to reduce the prices of nutrition-rich foods. Fresh fruits, many vegetables and healthy animal-sourced foods like milk, eggs and fish are often very expensive, especially when compared to calorie-rich but micronutrient-poor grains and tubers. In poor countries, the high cost of these nutrition-rich food stems from low farm-level productivity as well as inefficiencies in the post-harvest stage (storage, transport, and processing). There is also scope for designing nutrition-smart fiscal policies that favour healthy foods and tax unhealthy foods.

Finally, making healthy foods affordable is unlikely to be sufficient. Growing numbers of people in middle- and high-income countries consume excessive amounts of refined carbohydrates, saturated fats, sugar and salt – ingredients that elevate the risk of obesity, cardiovascular diseases and various types of cancer. Worryingly, we start to see similar unhealthy dietary patterns emerging among affluent consumers residing in low-income countries. This calls for more investments in nutrition education and more stringent regulation in food marketing so as to make consumers more aware of the health implications of their dietary choices.

A world free of hidden hunger can be achieved, but it requires global commitment – and a lot of work.

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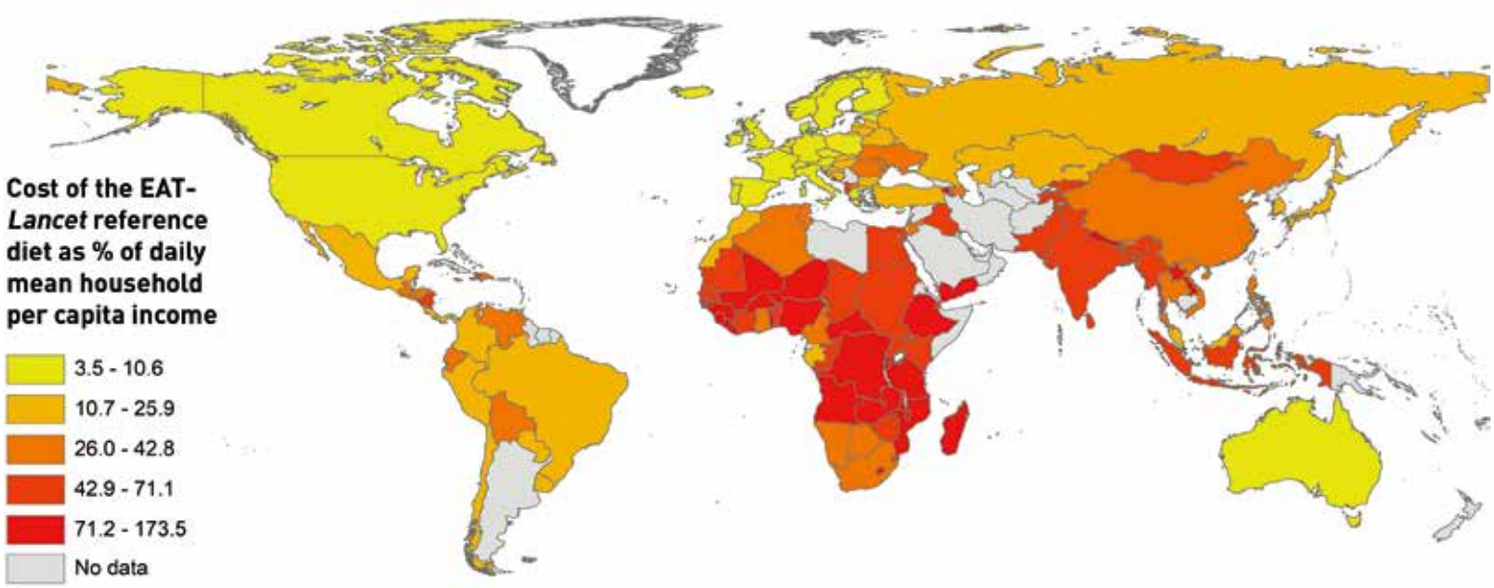
References: **www.rural21.com**

**Affordability of the EAT-*Lancet* reference diet across the globe**




Source: Hirvonen et al. (2020)

# Towards sustainable diets and planetary health: lessons from early research and knowledge gaps

**In 2019, the EAT-*Lancet* commission launched a thought-provoking report proposing the "planetary health diet". The idea was to formulate a diet that is both healthy and environmentally benign in terms of limiting societies' environmental footprints. So far, however, we know far too little about how governments and other stakeholders can cost-effectively govern globalised sustainable food production and consumption systems. Our authors summarise recent research on measuring health and environmental impacts of such systems as well as related policy interventions and propose ingredients of a future research agenda.**

**By Jan Börner and Ute Nöthlings**

Human diets and the corresponding food systems have a strong environmental impact and play an elementary role in meeting the planetary boundaries of greenhouse-gas emissions, cropland use, water use, nitrogen application, phosphorus application and biodiversity losses. Without change in dietary patterns and bio-based feedstock demand across the globe, the environmental footprint of human consumption will permanently exceed planetary boundaries and thus undermine the capacity of ecosystems to support human societies. At the same time, dietary intake is strongly associated with human health in that it has to be nutritionally adequate and limit the risks of common non-communicable diseases, i.e. diseases that are not transmissible directly among people, such as heart diseases, many types of cancer, and diabetes.

Photo: Bilderbox.com

The concept of sustainable diets integrates across these human and environmental health dimensions of dietary patterns by defining as sustainable "… those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources." (FAO, 2010)

In 2019, a planetary health diet (also called the EAT-*Lancet* reference diet) was proposed as a general dietary pattern to optimally align dietary health effects and environmental impacts considering global food system linkages. Despite the attention raised by the EAT-*Lancet* proposal, a number of critical reactions from academia and civil society pointed to considerable knowledge gaps in the way of designing food systems, or more broadly, bio-based production and consumption systems that holistically address planetary health outcomes. Here we summarise key knowledge gaps and propose elements of a research agenda that supports evidence-based decision-making towards sustainable food and biomass production and consumption systems.

## Diets, health and the environment

Suboptimal dietary intake increases mortality and reduces disability-adjusted life years world-wide, with high sodium intake, low intake of whole grains and low intake of fruits being the leading dietary risk factors. For example, meta-analyses of epidemiological studies show that intake of whole grain, vegetables, fruit, nuts and fish are inversely associated with risk of type 2 diabetes, hypertension, cardiovascular diseases or early disease risk markers, as well as with disability-adjusted life years or mortality. Intake of red meat, processed meat and sugar-sweetened beverages is positively associated with such negative health outcomes. However, our knowledge remains limited with regard to how diets are systematically linked to environmental health, nutritional adequacy and human health.

Only few studies have so far explored individual dietary intakes regarding indicators of environmental health, which would allow to directly link environmental footprints of individual diets with health outcomes. A number of tools are being developed, nonetheless, to trace the footprints of aggregate consumption data back to its origins, e.g. TRASE, which stands for "Transparent supply chains for sustainable economies". TRASE enables analysts to calculate detailed spatially explicit emission footprints for agricultural production across a whole value chain from a supply side perspective. The SHARP database (Sustainable, Healthy, Affordable, Reliable and Preferable), on the other hand, adopts a demand-side perspective to inform consumers in the European Union about environmental impacts of their dietary patterns in terms of greenhouse gas emission and land use. Still, many environmental impacts of diets across the world cannot be assessed due to data gaps. As a result, researchers studying the impact of dietary behaviour on environmental health often rely on highly aggregated data and modelling approaches.

Importantly, studies linking self-selected diets and nutritional quality suggest that an environmentally friendly diet is not necessarily healthy. Clearly, dietary energy and meat intake are paramount to mitigate diet-related environmental impacts. But, net outcomes are determined by the choice of meat replacements and potential spill-over effects towards non-food consumption. Still, adherence to the planetary health reference diet was found to be inversely associated with chronic disease risk, and some country specific adaptions have already been developed. In fact, food-based dietary guidelines (FBDG) are usually country-specific recommendations of wholesome diets for populations or population groups. As such, they include general rules advising food choice taking a range of aspects into account. Although sustainability criteria are increasingly considered, not all FBDG have included such aspects yet, and there is evidence that adoption of FBDG with specific public health targets does not necessarily support environmental health. Clearly, regional and target group specificity of sustainable diets need to be more widely addressed by future research.

## Effective policies lacking so far

Knowledge gaps about health and environmental impacts notwithstanding, governments, civil society and the private sector around the world are implementing policies and programmes to govern food and biomass system dynamics. Equally important in affecting these system dynamics are policies and socio-economic drivers that emerge in other sectors, such as the non-food industry, infrastructure and finance. Often, the resulting and frequently incoherent policy and incentive mix driving the behaviour of actors along all food and biomass value chains does not result in the desired behavioural outcomes.

Commonly, a distinction is made between governance of the demand versus the supply side of food and biomass systems. Traditionally, economists have argued that negative social and environmental externalities from these systems be ideally addressed by supply-side policies, such as regulations, taxes or subsidies imposed by governments. This intervention logic assumes that once food prices reflect the actual social and environmental costs of production, end-consumers will automatically adjust their behaviour towards more sustainable, though not necessarily healthier, consumption patterns. It may surprise, at first glance, that there is little empirical evidence confirming this conjecture in the context of food and biomass systems. Two separate factors may be at play. First, technological innovation in food and biomass production has to some extent enabled land users to comply with effective environmental regulations, while keeping food prices low. Second, especially in parts of the world currently witnessing the lion's share of agricultural expansion into natural ecosystems, land use and conservation policies were shown to exhibit comparatively low levels of effectiveness. As a result, supply-side interventions have so far arguably done rather little to change consumer behaviour.

Instead, a growing body of academic literature deals with the impact of consumption on production, resource use and land use patterns. Bruckner et al., for example, demonstrate how changing non-food biomass consumption patterns in the EU have resulted in an increasing land footprint of EU consumption outside EU boundaries. Popular initiatives to influence consumption choices via increased transparency in food and biomass value chains have since been promoted by both civil society and private sector organisations. However, there are limits to what can be achieved through voluntary behavioural changes informed by value chain transparency. The still small number of studies evaluating sustainability certification schemes point to highly context-specific impacts.

Some countries have instead experimented with demand-side policies, such as taxes on unhealthy food components with ambiguous results. The Danish fat tax, for example, was abandoned after two years in 2013 for diverse, including political, reasons. It was found to have had a positive, but minor, effect on public health.

So far, the academic debate on dietary health impacts synthesised above takes place largely detached from research on the effectiveness of supply- and demand-side interventions to internalise social and environmental externalities of food and biomass systems. An exception is the growing empirical literature on consumer choice architecture, which points to a series of promising and low-cost intervention options to nudge customers towards both healthier and environmentally more sustainable consumption choices. This includes, for example, traffic light labels on food packaging that indicate health and environmental risks to induce more sustainable consumption decisions.

Below we highlight key ingredients of a future research agenda that addresses gaps and missing links between the research fields summarised here.

## The way forward

The scientific evidence on the current mismatch between health requirements, dominant diets and planetary boundaries is overwhelming. And yet, our knowledge about what constitutes globally accessible dietary options that minimise the environmental and social impacts of production is limited. Even less evidence exists on how globalised food and biomass systems can be governed towards providing such diets. A research agenda to overcome these knowledge gaps should address the following non-exclusive lists of challenges:

- Improve the data base linking dietary choices including non-food biomass consumption to local and global impacts in key planetary health outcome dimensions, i.e. human and environmental health as well as socio-cultural impacts.
- Improve system understanding focusing on nexus relationships between health and environmental impacts of food and biomass production and consumption.
- Build a systematic evidence base on the effectiveness of governance measures in affecting food and biomass consumption and production decisions.
- Expand analytical system boundaries to study the role of non-food economic and policy factors in driving food and biomass system outcomes.
- Improve regional and sectoral aggregation of modelling and simulation tools and the empirical basis for their parameterisation in order to inform decision-makers with policy-relevant scenario analyses.
- Mainstream the planetary health perspective in the developing context and stakeholder-specific policy recommendations and dietary guidelines.

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References: **www.rural21.com**

In the MUSEFO Project, women in care groups learn about topics like mother, infant and young child nutrition.

Photo: Dominique Uwira

# Tackling the double burden of malnutrition

**Many low- and middle-income countries are confronted with the phenomenon of nutrition transition. Using developments in Cambodia as an example, our authors demonstrate the consequences this has for people's health and the attempts being made to address the issue.**

**By Dominique Uwira and Nicole Claasen**

The pace of change in demographics and public health has quickened in recent years. Among other factors, urbanisation, economic growth and technological inventions have brought about changes in populations' health and nutrition status which are described by the US American nutrition and obesity researcher Barry Michael Popkin with five broad nutrition patterns, ranging from collecting food (1), through famine (2), receding famine (3), nutrition-related non-communicable diseases (NR-NCD) (4) and, lastly, to behaviour change (5). The shift between the patterns 3 to 5 is synonymous, for many, with the term nutrition transition, and its associations between nutrition and health are shown in the Figure.

The rapid shift between the end of famine and overeating along with the emergence of NR-NCD can be found in many low- and middle-income countries, including Cambodia. This pattern shift comes along with a dietary shift from traditional, starchy, low variety, low fat and high-fibre diets towards diets with increased low-quality fat, sugar and refined carbohydrates, and processed foods – the so-called Western diet, which can also be observed in Cambodia. At the same time, activity patterns shift towards a more sedentary lifestyle, leading to a higher energy intake and a lower energy expenditure in general.

## How globalisation and the nutrition transition interrelate

The phenomenon of the nutrition transition is the result of a number of demographic, economic, social and behaviour changes that affect daily life in Cambodian society. Globalisation and the implementation of market-oriented agricultural policies during the last decades have led to a more liberal global agricultural marketplace, which enabled food trade, higher foreign direct investments and the expansion of transnational food companies. Thus, globalisation affects the availability of and access to food by changing the way it is produced, processed, procured, distributed and promoted. This has led to major changes in the country's food culture, with significant shifts in dietary patterns and individual nutritional status. High foreign direct investments in processed foods made them available on local markets, which resulted in increased consumption of these products, often also driven by aggressive food marketing adapted to the local context.

Against this background, two simultaneous mechanisms within the context of globalisation have an effect on dietary choices and consumption habits: dietary convergence (homogenisation of diets with high consumption of animal-source foods, edible oil, sugar, salt and low intake of a variety of staples and fibre; mainly driven by price) and dietary adaption (increased consumption of brand-name processed foods and meals eaten outside the home together with changes in household's eating behaviour; mainly driven by time constraints, advertising and availability). The change in Cambodia is being brought about by the trend that fewer and fewer traditional healthy dishes are being self-prepared as more food is purchased from outside the home, where it is difficult to control ingredients and cooking procedures. Ultra-processed convenience food has become readily available even in the most remote areas, where it relieves busy mothers increasingly entering the workforce of their already heavy burden at home.

Apart from globalisation, other factors such as modernisation, urbanisation, and continued economic growth paired with increased household income and wealth have amplified these dynamic shifts in everyday lifestyle, dietary intake and physical activity patterns amongst the Cambodian population. The shift from traditional diets to Western-style diets has been a key contributor to increased obesity rates in this Southeast Asian country. As income continues to rise, individuals can afford an abundance of high-calorie convenience foods whilst at the same time becoming less active, leading to increases in obesity and obesity-related chronic illnesses such as diabetes and heart disease.

## The double burden of malnutrition – a particular challenge for Cambodia

The new dynamics and the altered nutrition situation have led to an emerging twofold challenge called the double burden of malnutrition, meaning that undernutrition - described by wasting, stunting and micro-nutrient deficiencies - and overweight or obesity coexist within the same generation and household, and even among the same individuals throughout their lifetime. In the specific case of Cambodia, the double burden of malnutrition is characterised by high prevalence of child stunting (32.4 %, 2017) and anaemia in women of reproductive age (46.8 %, 2016), whilst NCD rates were simultaneously estimated to account for 64 per cent of all deaths in 2016, and communicable, maternal, peri-natal and nutrition conditions accounted for 24 per cent of all deaths in the same year. Six of the top ten causes of disability-adjusted life years (a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death) in Cambodia in 2017 were NCDs, with remarkable increases in the burden of strokes and diabetes over the last decade.

In terms of consumption patterns during the complementary feeding period, a study conducted by Pries et al. (2017) showed that a considerable proportion of the children aged six to 23 months in Cambodia's capital Phnom Penh were fed with infant formula and powdered milk. Drinks containing high amounts of sugar (soft drinks, fruit drinks, chocolate-based or malt-based drinks) were consumed by up to 20 per cent of the children aged 12-23 months. Within the same age group, commercially produced snack foods were the third most commonly consumed food group, with a preference for savoury snack foods, such as chips or crisps. In the study sample, snack foods were more commonly consumed than micronutrient-rich fruits and vegetables. The results indicate that regular consumption of commercially produced snack foods is very common in children under the age of two years in the urban setting of Phnom Penh. Mothers said the main reasons for feeding this type of food to their children were that the child liked the snack food and demanded or cried for it. 21.5 per cent of them also believed these snacks were healthy for their child.

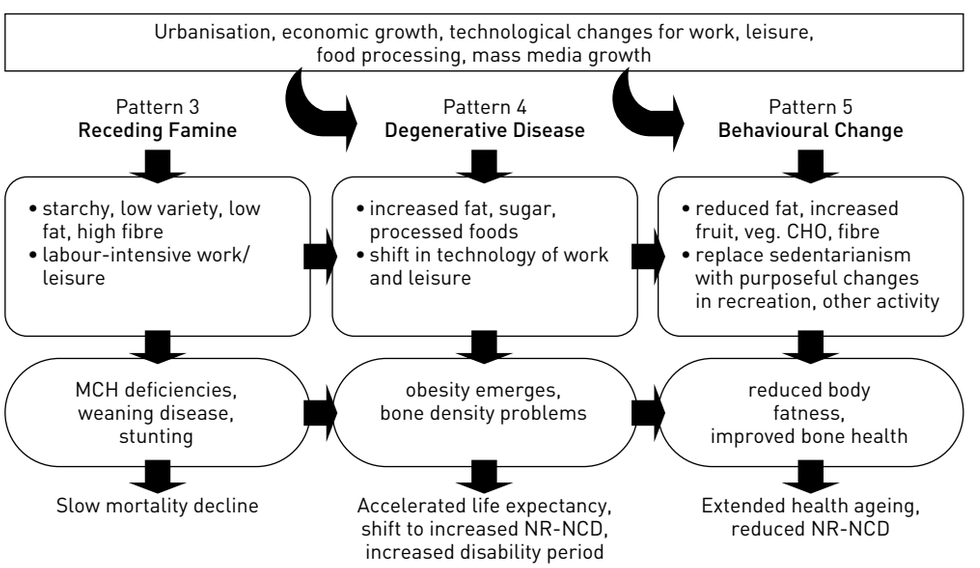
A study conducted in a rural community in Siem Reap (SR) province and in a semi-urban community in Kampong Cham (KC) province found prevalence of impaired glucose tolerance (preliminary stage of diabetes), diabetes and hypertension of 10 %, 5 %, 12 % (SR) and 15 %, 11 %, 25 % (KC) respectively. These findings were unexpected to this degree as Cambodian society, in particular in those two areas, is relatively poor and the lifestyle is fairly traditional. Two-thirds of the study participants with diabetes as well as half of the participants with hypertension were unaware of their condition – an alarming result given the negative long-term effects of these conditions left untreated. As obesity prevalence in Cambodia is quite low, genetic susceptibility to diabetes and metabolic adaptions to early nutritional deprivations during the Khmer Rouge time were considered as possible explanations for the study's findings.

## Addressing all forms of malnutrition with a multisectoral and multi-level approach

In order to address the problem, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) launched the Multisectoral Food and Nutrition Security (MUSEFO) Project in the two provinces Kampong Thom and Kampot in 2016. Activities are carried out in the health, nutrition, WASH (water, sanitation and hygiene) and agriculture sectors at household, village, provincial and national levels.

With policy advice at national level, the project supports the integration of food security and nutrition aspects in national policies and guidelines. This has resulted in the country's 2nd National Strategy for Food Security and Nutrition (NSFSN, 2019–2023) acknowledging the double burden of malnutrition within the Cambodian context and declaring the promotion of healthy diets and nutrition-sensitive food value chains as priority actions, among others. Food policy changes are seen as a major option for improving nutrition, but they will not be adequate without shifting the culture of eating. Therefore, the project has created care groups at local level that provide a platform for women to meet on a regular basis and learn about mother, infant and young child nutrition, childcare and hygiene practices, focusing on interpersonal behaviour change communication. The leaders of the care groups, who are community-based health volunteers, meet regularly with project staff for training and supervision. They are responsible for continuous training and coaching of the care group members in care group sessions and during home visits. In the sessions, the group leaders share insights on nutrition and health and encour-

**Patterns 3 to 5, illustrating the nutrition transition**




MCH = Mean Corpuscular Hemoglobin; CHO = carbon, hydrogen, oxigen

Source: Popkin, 2002

age participants to put their newly acquired knowledge into practice at household level and within their community. Training and empowering people, in particular pregnant and breast-feeding women, and supporting efforts of citizens working together to change their communities and regain food sovereignty is key. In addition, nutrition-sensitive agricultural activities are implemented using seasonal calendars combining agricultural practices with nutrition and health information and practical cooking recipes for young children. The seasonal calendars are supporting farmers to identify the right timing and techniques for cultivation and harvest.

The MUSEFO Project looked into possibilities to promote healthy snacking options. It worked together with food vendors from the target areas to develop recipes for healthy snacks such as brown rice waffles with moringa, purple sweet potato smoothies or ice cream with pink dragon fruit and unsweetened coconut milk. The recipes were tested with the target group and are currently compiled in a recipe booklet for the wider population.

## Forming of an alliance to fight NCDs

Beyond the activities of the MUSEFO Project, GIZ has established the Cambodian NCD Alliance (CNCDA). The CNCDA was officially launched in March 2019 to call for greater action to tackle the rising burden of NCDs, and build a new platform for collaborative action. The mission of CNCDA is to put NCDs firmly on the political agenda, by joining forces with those working on NCDs and their risk factors to build a platform for collaborative advocacy and a common agenda to accelerate action and mobilise resources necessary to prevent and control NCDs among the Cambodian population. The CNCDA is currently an informal alliance, with its secretariat based in Phnom Penh. So far, the CNCDA has 22 members consisting of civil society, bilateral and multilateral agencies, academia, researchers, relevant ministries and government agencies, patient groups and people living with NCDs who share its mission and vision.

The CNCDA has developed its first annual Action Plan to provide a framework for NCD prevention and control activities. The focus was initially on accelerated action on the prevention of NCD risk factors and sustainable financing for NCDs. However, the impact of the recent COVID-19 pandemic has shifted it with the CNCDA now calling for the inclusion of NCDs in the national COVID-19 Preparedness Response Plan. The CNCDA has just been awarded its first grant by the Solidarity Fund on NCDs and COVID-19, which was officially launched mid-July 2020 by the NCD Alliance. Activities in the 2020 Action Plan include:

- Identify and recruit champions to raise awareness of key messages and advocate for greater attention to NCDs.
- Produce evidence-based policy briefs to provide information to decision-makers who support key advocacy priorities.
- Produce written content and disseminate key messages via social media channels and other communication platforms.
- Produce fact sheets on NCD risk factors and main diseases in Cambodia.
- Identify ways to increase the involvement of people living with NCDs and document lived experiences of NCDs.
- Expand and diversify CNCDA membership by establishing connections with key stakeholders across multiple sectors.

## Policies and food systems must change

Many low- and middle-income countries have seen substantial economic growth in the last decades, with rising income and therefore increased purchasing power of the consumers along with changing lifestyles, making them particularly susceptible to the nutrition transition. The food industry plays a major role in the structural flaws that affect the most vulnerable groups the hardest. With new global actors such as transnational agri- and food businesses, including global and local food and beverage producers and food service companies, but also local food retailers increasingly influencing food production and subsequent food purchases, the challenges posed for obesity and NR-NCD prevention are great.

While the manifestation of the nutrition transition differs across countries and regions, there are some key interventions that can be considered for most of those countries. Overnutrition, and especially obesity, have been largely ignored in national nutrition and health strategies within those countries that are still characterised by high prevalence of undernutrition. Keeping in mind the tremendous long-term public health and economic consequences that come along with the double burden of malnutrition, rapid policy and programme shifts are needed to address all forms of malnutrition. It is well-known from high-income countries that the treatment and management of NR-NCDs is extremely expensive. Low- and middle-income countries are particularly challenged regarding allocating funds within their health budgets for treatment options as they are already struggling to provide for primary preventive undernutrition care. Currently, prevention efforts are the only feasible approach to address the upcoming epidemic of NR-NCDs in countries affected by the double burden of malnutrition. Progressive changes in government policies at national and alignment with subnational levels, law regulation and enforcement, alongside shifts in local food systems, from production to marketing, purchasing and consumption as well as individual behaviour changes are of the essence when it comes to improving the way people grow food, work, eat, move and enjoy life.

### THE MANY FORMS OF MALNUTRITION

**Malnutrition** occurs in different forms – it is a collective term that includes **undernutrition** (underweight, stunting, wasting), **micronutrient deficiencies** and **overweight** and **obesity**, often leading to nutrition-related non-communicable diseases (NR-NCD), disproportionately affecting the poorest, minorities and people most vulnerable to food insecurity. **Wasting**, defined as low weight-for-height, indicates a recent and severe weight loss due to acute undernutrition, while **stunting** is defined as low height-for-age and results from chronic undernutrition which is usually associated with poor socio-economic status, poor health and inappropriate child feeding early in life. A child suffering from **underweight**, measured as low weight-for-age, might be wasted, stunted or both. **Overweight and obesity** on the other hand are defined as an excessive fat accumulation. Persons affected by this condition are too heavy for their height.

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References: **www.rural21.com**

# “Reducing malnutrition levels calls for concerted efforts”

*A multicausal problem like malnutrition cannot be sustainably solved by a one-sector approach. This is why the Ministries of Agriculture and Health agreed to join forces in Kenya. Rural 21 talked to Jane Wambugu Wanjiru, Head of the Agri-Nutrition Unit at the Kenyan Ministry of Agriculture.*

**Ms Wanjiru, in Kenya, the Ministry of Health and the Ministry of Agriculture have been cooperating closely since 2017. Why?**

**Jane Wanjiru Wambugu:** In Kenya, the level of malnutrition is high, both in terms of stunting and wasting, and in terms of overweight and obesity. The Ministry of Health, which has the mandate for nutrition policy, and the Ministry of Agriculture, which is responsible for food policies, saw the need for concerted efforts to tackle this problem.

**How did you develop this cooperation?**

In 2017, the food and nutrition security policy implementation framework was developed, co-ordinatinng policies at both National and county government level. For the devolution of agricultural extension, to mention an example, is the mandate of the county government. The same applies to health extension. At the national policy level, we have the Kenya National Nutrition Action Plan (KNAP) 2018–2022. In the context of this action plan, we created a food and nutrition linkages technical working group that plans for nutrition-related interventions which are based in agriculture. In accordance with KNAP, key department areas were identified at each ministry which compile the respective documents, for example the Agri-Nutrition Strategy 2020-2025. The aim is to further link the policies in food to the policies in nutrition and health, thus delivering on the mandate to reduce malnutrition levels in Kenya.

**Has this already resulted in concrete initiatives?**

In 2017, we ran the first National Agri-Nutrition Conference. Both the counties and national governments were involved. Since then, we have held such a conference each year. It is a forum in which we bring together all the stakeholders who are doing nutrition work in agriculture. Responding to COVID-19, the national government has installed the One Million Kitchen Gardens campaign. The aim is to mainstream nutrition in the agriculture value chain. With this we are supporting households – especially the vulnerable households – with a variety of seedlings to plant fruits and vegetables. Moreover, all the programmes in agriculture have a nutrition component. Every proposal made that is related to agriculture and has a nutrition goal is provided with support via a grant. Furthermore, there is the School Meals Strategy 2017–2022. Here, the role of agriculture is to stimulate home-grown school meals. The school committees are strengthened through the capacity to procure safe nutritious foods within the local communities, stimulating production and consumption of diverse food at school level.

**Jane Wanjiru Wambugu** is Head of the Agri-Nutrition Unit at the Kenyan Ministry of Agriculture, Livestock, Fisheries and Cooperatives.
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**What are the biggest obstacles on the way to better nutrition?**

Maize flour is a staple food in Kenya. Normally, it is over-processed. But because it is easy to cook and is also easily available, almost 90 per cent of households in Kenya consume maize meal. Here, the Ministry of Health has launched an initiative to fortify the maize flour in order to make it more nutritious. But this is not enough. A study done in 2015 shows that the consumption of fruit and vegetables is very low in Kenya. Changing this so that the households consume at least five servings of fruit and vegetables a day, as recommended by the World Health Organization, calls for behaviour change and campaigns addressing the issue.

**Is there a difference between dietary patterns in rural and urban areas?**

The same study – the STEPwise survey for non-communicable diseases risk factors – has shown that there is not so much of a variance in terms of rural and urban. Sometimes, the urban population even consumes better than the rural households, the reason being that different types of food are available. What prevents them from being consumed more is their cost, their affordability. In the rural settings, in some regions, people consume more beef than any other food because that is what happens to be available and what they themselves produce. But when people produce for the market, for example French beans or cauliflowers, these products often do not end up in the rural households because they are not affordable in the rural settings. However, production for income doesn't translate into better nutrition, because the income gained through crop sales doesn't translate into buying nutritious foods. This has been noted in cash crop sectors like coffee and tea, where we still find high levels of malnutrition at household level.

**How is the Agri-Nutrition Strategy developing?**

In implementing our Agri-Nutrition Strategy, we want to achieve more engagement and cooperation between the national and the county governments, between the private sector and civil society, and between all stakeholders. One example here is the flour-blending initiative for household food and nutrition security, income and employment creation. With this initiative, we are trying to improve the nutrition content of our maize meal by blending maize with more nutritious flours like millet and sorghum. Here, the role of the private sector is critical because it is the millers who process the blended flours. At the same time, the farmers need to produce the blending crops which currently are under-produced due to climatic conditions. So there is a need for more engagement between the national and county governments as well as with the private sector to produce and process blended flours. Any programme designed, whether in crops, livestock, or fisheries, is now required to have a nutrition objective to attract any funding. The need to understand nutrition indicators in agriculture is a capacity-building agenda both for national and county government, because, for a long time in Kenya, nutrition was seen as a health issue. Retraining the extension workers on nutrition matters in agriculture value chains is our next initiative.

Full interview: **www.rural21.com**

# Civil society's engagement for better nutrition – the case of Namibia

**Just like in many other countries, the COVID-19 pandemic has revealed the weaknesses of the food system in Namibia. And it has shown that the multifaceted causes of malnutrition can only be tackled by coordinated multi-stakeholder action. Our author describes how existing structures can be revitalised for this purpose and the role that the newly founded Nutrition and Food Security Alliance of Namibia is playing in this context.**

**By Ben Schernick**

Namibia, the second most unequal society in the world according to World Bank data, is particularly challenged when it comes to hunger and malnutrition. In 2018, an ongoing economic recession escalated into a depression, while at the same time Namibia was experiencing one of the worst droughts in its history, with provisional crop harvests almost 50 per cent below the 20-year average production.

Poverty levels among Namibia's population of ± 2.5 million remain disproportionately high and over a third of the population are unemployed. The Namibia Labour Force Survey from 2018 found that this particularly affects the youth, with 46.1 per cent under 35 years and 59.9 per cent under 25 years without employment. In addition, Namibia carries the heavy double burden of malnutrition, with a quarter of children (± 24%) stunted, chronically undernourished and at risk of insufficient brain development. Such stunting then again contributes to GDP losses of up to 16.5 per cent, hereby generating a vicious circle. At the same time, Namibia – a meat-loving country with high sugar and fat consumption, where healthy diets are not yet all too popular – has adult obesity rates of almost 20 per cent.

All of the above was already the reality prior to COVID-19 and had serious implications for people's health and lives, and these were the very painful symptoms of huge societal inequalities, as well as a clear lack of proper nutrition education and awareness. When the pandemic reached Namibia in March 2020, the country went into lockdown, hereby delaying the first wave, which is about to hit the country very soon, with an expected peak in cases around September. These measures sent the country's economy – with tourism as a critical sector – into steep decline and have caused many people to lose their jobs. This particularly hurt those who were already not earning much and had no savings at all. They are among the 25 per cent of the population who can only afford to live in shacks in one of the urban informal settlements. The situation in rural areas is similarly dire, and sometimes even worse.


The poster with *Key messages on Nutrition and Food Safety during COVID-19* is available in twelve local languages.

At the same time, however, countless private initiatives from companies and committed individuals – such as Co-Feed Namibia – across the country started collecting and distributing food to those in need, resulting in an unexpected wave of solidarity and support among Namibians from all walks of life. This also led to a growing awareness of the already existing huge inequalities, as people realised that many had to "stay at home" for weeks, with their whole family in a one-room shack, with only an outside toilet, and with no source of income and no food supplies. In this regard, the Namibian government and international partners also put a variety of measures in place to reduce the heavy impact of Covid-19 on people's lives and livelihoods, hereby also realising Namibia's high dependency on food imports.

## A national coordination structure for food and nutrition security

Already since 2017, the Namibian government had actually engaged multiple stakeholders to revive its multi-sectoral and multi-stakeholder Food and Nutrition Security Coordination Structures alongside an updated Food and Nutrition Security Policy and an accompanying Implementation Action Plan. All of these are expected to be finalised, approved and active before the end of 2020.

The new national coordination structure will receive high level support from Cabinet and the Prime Minister's Office, with the Ministry of Agriculture, Water and Land Reform fulfilling critical function as the National Secretariat, which is to collaborate closely with sub-national secretaries. Attention was paid to not unnecessarily create costly new structures,

but to build on existing ones, while focusing on improved communication, especially with the Ministry of Health and Social Services and other Government offices, ministries and agencies, as well as with non-government stakeholders and partner organisations. Such a complete overhaul of the system was necessary because Namibia's very first multi-stakeholder platform, the Namibian Alliance for Improved Nutrition (NAFIN) through which the country joined the Global Scaling Up Nutrition (SUN) Movement in 2011, had become dormant in recent years.

It was against this background that in late 2018, the SUN Movement Pooled Funds offered support to Namibian civil society, academia and private sector in coming together and strengthening civil society's involvement in nutrition-related matters. A 1.5 year-long participatory process led to the establishment of the Nutrition and Food Security Alliance of Namibia (NAFSAN) in late 2019. NAFSAN will be a key partner within the national coordination system at national and sub-national level and has contributed to the development of the future structure, policy and action plan. Together with its future members, NAFSAN will also play a key role in implementation, monitoring, reporting, educating and advocating for better nutrition and sustainable food security.

At this point, the private sector is not much involved in areas of nutrition and food security. Only the companies Namibia Dairies and Namib Mills have actively participated, for instance in food fortification. Hence, for the time being, the private sector has been included in NAFSAN as a civil society alliance, until there are a sufficient number of committed private sector organisations to establish an independent yet interdependent nutrition business network.

Overall, NAFSAN was only officially established in March 2020. It is therefore still in its infancy stages and needs to grow its membership base. Yet, in early April, prompted by the first COVID-19 cases in Namibia, NAFSAN collaborated with UNICEF and the Ministry of Health and Social Services in adapting existing national nutrition guidelines within the context of the new pandemic. Posters and flyers on *Nutrition and Food Safety during COVID-19* were developed, and thanks to the fast and unbureaucratic financial support from various Namibia projects of Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) they could be translated and printed in twelve local languages. Since April, and also now that the incidence of COVID-19 is on the rise, various local and international civil society organisations, academic institutions and UN agencies are supporting the distribution of these materials into the various regions and communities. NAFSAN's proposal for initial funding towards organisational development and sustainability was approved by GIZ in June, so that operations for the first year until June 2021 are now approved. Simultaneously, NAFSAN has also officially become an active member of the SUN Civil Society Networks at a global and regional South and Eastern Africa level.

A local fruit vendor reading the flyer on *Nutrition and Food Safety during COVID-19*. Photo: Ben Schernick

## From permaculture gardening to mini-Zoominars

With such strong institutional support and financial security, NAFSAN is now able to focus on solidifying its internal good governance structures and tackling the tasks it has set itself: supporting the establishment of the national coordination structure, policy and action plan, reaching out to future members at national and sub-national levels, continuing to inform and educate the public through media appearances and a variety of educational information materials, and involving national and international high-level nutrition champions and influencers. Furthermore, it can now develop practical and participatory nutrition training especially for young people from marginalised communities, seek additional funding for practical projects that will be implemented by its member organisations, as well as secure funding for sustainably establishing itself at national and sub-national levels.

One of NAFSAN's first practical projects currently in the pipeline is the development of a holistic, sustainable and scalable approach to combining permaculture gardening with practical nutrition in poverty-stricken informal settlements, in collaboration with already established and experienced member organisations who are known for their innovative approaches.

Overall, reaching and working with communities in urban and rural areas across the country through its member organisations is therefore one of the Alliance's major focal areas. At the same time, information sharing, education, communication (IEC) and advocacy at national level are also crucial. Some IEC materials have already been developed, and Miss Namibia 2019 and the musician Kalux have already come on board as national nutrition champions/influencers. In this regard, one upcoming project is going to shed more light on Namibia's nutritional landscape, some of its key role-players and their areas of work. It will be a series of short regular mini-Zoominars, scheduled for September and October, whereby all recordings are to be made available on NAFSAN's website afterwards.

Until recently, Namibia was one of only nine African nations classified as upper-middle-income countries, which significantly reduced Namibia's access to 'soft loans' and has led to a massive withdrawal of minor and major international donors and development partners, especially affecting the most vulnerable of Namibia's population. However, now that Namibia has been re-classified as a middle-income country since mid-2020, its odds of receiving the support needed to address the humungous tasks ahead of successfully addressing severe hunger, malnutrition and major inequalities are starting to look much better again. This is something that is possible with transparent and collaborative efforts from within the country and with support from international partners and friends.

**Ben Schernick** is a social worker and mediator by profession who is based in Windhoek, Namibia. He has worked with civil society and international development organisations, as well as academic and government institutions in training, curriculum development, consulting, facilitating dialogue processes and project management. As from October 2018 he has facilitated the process leading up to the establishment of NAFSAN, and is currently serving as acting Director of its Secretariat.
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References: **www.rural21.com**

# Helping 'local favourites' join the race for healthier diets

**'Traditional' vegetables are crops that are grown in their region of origin or were introduced many generations ago. They are generally sturdier and more nutritious than vegetables traded globally, but tend to be under-utilised. Our authors show how the rapidly eroding diversity of these vegetables can be countered and how they can be integrated in today's food systems.**

**By Marco C.S. Wopereis and C. George Kuo**

About one in every three people suffer from malnutrition, be it hunger, micronutrient deficiencies, or overweight/obesity. This is caused by a combination of dietary and health factors. Increased consumption of healthy, nutrient-dense foods, such as vegetables, and reduced intake of unhealthy and processed foods will improve nutrition. Vegetables are among the most affordable sources of vitamins, minerals and plant-based proteins, which are essential for good health. However, vegetable intake world-wide is far below the recommended World Health Organization (WHO) minimum of 240 grams and the EAT-*Lancet* Commission recommendation of 300 grams per person per day, with the exception of East Asia.

Vegetable diversity in Yogjakarta market, Indonesia.

Photo: World Vegetable Center

## The special case of 'traditional' vegetables

'Global vegetables' such as tomato, peppers, onion, brassicas, eggplant, carrot and beans are ubiquitously produced, commercialised and consumed. However, there are hundreds of traditional vegetables that are locally produced and socially and culturally accepted as local foods, such as leafy amaranth in East Africa, Malabar spinach in India and slippery cabbage in the Pacific Islands. These 'traditional vegetables' are either endemic crops that were domesticated and cultivated in the same place they originated from, or crops that have been introduced into a country and are now recognised as traditional vegetables. The huge diversity of traditional vegetables is more than a local peculiarity – they could potentially play a much greater role in ensuring adequate levels of nutrition in particular in low-income countries. Traditional vegetables have a much higher nutritional value than their global counterparts, such as cabbage and tomato, and offer an important source of vitamins and minerals (see Table on page 20). They also contribute to climate resilience by diversifying farming systems and create important income generation and job opportunities both on- and off-farm.

But traditional vegetables tend to be underutilised, undervalued and poorly integrated in current markets and diets. Consumers may not recognise their nutritional value and may even consider them as 'old fashioned' and 'poor man's food'. Some traditional vegetables are associated with long preparation time and not fit to be integrated into 'modern' recipes. However, there is evidence that these vegetables are making a comeback, e.g. in East Africa, with traditional vegetables like amaranth, jute mallow, spider plant and African nightshade being sold in restaurants, local markets and supermarkets.

## Global trends putting a tradition at risk

The tremendous diversity of traditional vegetables is a great asset, since it provides many opportunities to adapt to local growth conditions, adding colour, taste, nutrition and health qualities to people's diets. Conserving vegetable diversity is crucial as different land races and wild relatives may have very important still-to-be discovered nutrition and health qualities and agronomic traits, such as resistance to pests and diseases or tolerance to drought. There is considerable evidence that traditional vegetables are hardier, i.e. better adapted to marginal soil and climate conditions and pest and disease pressure than their global counterparts. These traits may be very useful in future breeding programmes.

The use of traditional vegetable diversity in farming systems around the world is in decline because of diet homogenisation,

food production homogenisation and urban migration. To maintain this diversity, it is necessary to conserve and document vegetable landraces, their wild relatives and traditional knowledge of these vegetables before they are lost. This is particularly important for Africa. A recent study focusing on 126 traditional African vegetables showed that only a few (e.g. common bean) were conserved well in genebanks in Africa. About one-third of these vegetables were represented by less than ten accessions, or even no accessions at all. To secure these genetic resources for humanity, it will be necessary to organise collection missions for ex-situ conservation, upgrade seed banks in Africa to keep the seed safe, and support national conservation programmes to improve the in-situ conservation of these vegetables and their wild relatives.

A farmer in Tsenanomby, Madagascar, showing her Ethiopian mustard and amaranth plots.

Photo: World Vegetable Center

## Finding 'local favourites' and boosting supply

The main bottleneck to integration of traditional vegetables into food systems is the availability of quality seed. Most traditional vegetables have not been the object of rigorous selection for local growth and market conditions or consumer preferences and dietary needs, let alone breeding work to improve productivity and marketability, with high once-over yield and uniform quality produce, whilst maintaining their nutrition and health qualities. There is a need to find 'local favourites' among the vast diversity found in a particular country or region that fit best in local agro-ecosystems and diets. This may indirectly benefit conservation efforts as policy- and decision-makers start to become aware of the value of traditional vegetables through their increased use.

The World Vegetable Center (WorldVeg) works with formal and informal seed systems to promote traditional vegetables. Seed companies are important partners because they can potentially reach large numbers of farmers. Beyond quality seed, and just like with global vegetables, attention needs to be paid to enhance productivity, marketability, and food safety and off-season production by promoting good agricultural practices, integrated pest management, and adapted and affordable protected cultivation methods. Post-harvest losses can be cut back and nutrition and health qualities maintained by improvements in transportation infrastructure, processing and cold storage, and by synchronising production and marketing.

## 'Grow your own' initiatives

Vegetables may be unavailable or unaffordable to consumers in low-income countries for at least part of the year. In such cases, it makes sense to promote production of vegetables for home consumption. WorldVeg has reached close to 100,000 households, working mostly with women, in Africa and Asia with home garden interventions over the last decade. Such interventions combine hands-on training in vegetable gardening with nutrition behaviour change communication. In East Africa alone, WorldVeg and partners distributed over 42,000 seed kits containing 183,000 vegetable seed samples to households in Tanzania, Kenya and Uganda. The seed kits contained traditional African vegetables, tomato, pepper and soybean. Participating households in Cambodia increased vegetable production by 43 per cent and extended the production period by four months. They also adopted a range of new production methods, including mini seed packs. Three years after a home garden intervention in Bangladesh, the former participants are producing, on average, 43 kg of vegetables per household per year, providing an important micronutrient supply of iron, zinc, folate and vitamin A. This is encouraging evidence of a long-lasting effect. Results from Africa were generally less conclusive, pointing, among others, to the need to pay greater attention to water constraints and better adaptation to local needs.

Given the large number of poor people living in and near urban centres in low-income countries, 'grow your own' initiatives focusing on nutrition-rich vegetables, such as Malabar spinach, jute mallow and spider plant in small spaces using sack gardens and vertical gardens deserve much greater attention. More research is needed to understand how these seed kits help to strengthen local seed systems, and how they can help households in evaluating a range of traditional vegetables for climate-smart agriculture and for new ways of farming such as urban agriculture.

Natural disasters disrupt food production and distribution systems. Fast-growing traditional vegetables can help restore local food supplies and provide nutrition to victims. WorldVeg seed kits with diverse and nutrient-rich vegetables are currently helping people cope with the effects of the COVID-19 pandemic in the Philippines, Taiwan and Thailand. WorldVeg and partners have also assisted victims of the tsunami in Indonesia and Sri Lanka, a typhoon in Taiwan, an earthquake in Haiti and floods in India, Thailand and Fiji.

## School garden and school meal programmes

Healthy eating preferences and habits are best learned early. Starting in 2014, WorldVeg and partners conducted school garden programmes in Burkina Faso, Bhutan, Nepal, Indonesia and the Philippines. Through a hands-on experience with gardening and nutritional education, children learned how to grow and appreciate healthy foods such as fruit and vegetables. They generally became more aware and knowledgeable about vegetables and liked to consume them, but a positive effect on vegetable consumption was found only in Bhutan. School gardens are too small to produce sufficient quantities of vegetables for school

lunches. Therefore, these school garden programmes were successful in working on the 'demand side', but not on the 'supply side'.

A follow-up study in Nepal combined the school garden programme with an integrated home garden programme for parents. This time, vegetable consumption of children increased by 15 to 26 per cent (depending on the season). Nudging children towards healthier food choices clearly requires targeting caregivers as well. Another way of solving the supply issue is to stimulate greater involvement of parents and local farmers in the school meal programme and source vegetables locally. Children benefiting from this approach in Nepal had a significantly higher provision of midday school meals (+19 %) and a higher school meal quality in terms of dietary diversity (+44 %) and nutritional content (e.g. a 21 % higher consumption of vitamin A-rich fruit and vegetables). Maintaining the observed gains would require a 20 to 33 per cent increase in the current budget per school meal in addition to the cost of capacity strengthening.

## Nudging people towards purchasing traditional vegetables

Many people, rural and urban consumers alike, in low-income countries will buy vegetables along the roadside, in wet markets and supermarkets, or in a restaurant. Consumers from all wealth classes need to be able to access and afford traditional vegetables and trust that they are safe to consume. Vegetables need to be appealing and easy to prepare and fit into local recipes. WorldVeg has been involved in promotional and demand creation activities for African vegetables in East Africa. This included road shows, cooking shows, nutritional sensitisation and awareness programme campaigns in hospitals, schools, markets and villages to enhance consumption and create demand and market incentives for producers.

The private sector takes care of many issues related to losses and food safety when products are sold in supermarkets. However, the majority of rural and urban consumers in low-income countries will purchase their food in informal, wet markets. This calls for reducing post-harvest losses and increasing hygiene and food safety. One of the key factors for success is to establish durable linkages between producers and markets or direct linkages between producers and consumers (e.g. through mobile phone applications) creating trust, traceability and reducing uncertainty.

## What has to be done

The nutritional and health potential of traditional vegetables is tremendous, but people's diets are currently moving in the wrong direction. East Asia's example shows that it is possible to include traditional vegetables in people's diets, and can provide lessons learned for other regions. Information campaigns are needed to raise interest in traditional vegetables – these should emphasise taste, cultural value and ease of preparation, and should not only advocate nutritional, health and environmental benefits. They could include promotion campaigns with chefs and consumer champions to celebrate nutrition, taste and cultural values of these vegetables.

Farmers will need support in terms of seed supply and good agricultural practices to guarantee food safety, raise productivity and extend growing seasons. Establishment of trust and traceability relationships and short connection lines between producers and consumers will address food safety concerns, enhance production and consumption and reduce post-harvest losses. Investments in food environments, in particular in wet markets in low-income countries, are needed to improve food safety, hygiene and reduce waste.

Care must be taken to conserve the diversity of traditional vegetables world-wide whilst starting up activities to promote their production and consumption. To secure the diversity of traditional vegetables, it will be necessary to organise collection missions for ex situ conservation, upgrade seed banks to keep the seed safe and support national conservation programmes to improve the conservation of these vegetables and their wild relatives in their natural habitats.

Last but not least, promotion of traditional vegetables must fit within local, national and regional initiatives to reduce malnutrition and to get crucial buy-in from policy- and decision-makers. It will help to emphasise that besides the nutritional potential of traditional vegetables, there is also tremendous economic potential, through income generation and job creation along the value chain from seed to retail, with clear opportunities for women and youth.

**Percentage of recommended nutrition intake (RNI) supplied by 100 g of selected commodities, including global (cabbage, tomato) and traditional vegetables for pregnant women***

| | Protein (g) | Vitamin A (µg RE) | Iron (mg) | Folate (µg) | Zink (mg) | Calcium (mg) | Vitamin E (mg α-TE) |
|---|---|---|---|---|---|---|---|
| RNI for pregnant women (1st trimester) | 60 | 800 | 30 | 600 | 11 | 1000 | 7,5 |
| | | | | Percentage (%) of RNI | | | |
| Rice | 12 | 0 | 1 | 2 | 4 | 0 | 0 |
| Cassava (root) | 2 | 0 | 1 | 5 | 3 | 2 | 0 |
| Millet | 6 | 0 | 2 | 14 | 8 | 0 | 0 |
| Meat (chicken) | 37 | 0 | 3 | 1 | 14 | 2 | 3 |
| Mungbean | 40 | 2 | 22 | 104 | 24 | 13 | 7 |
| Vegetable soybean | 18 | 2 | 13 | 28 | 13 | 4 | 78 |
| Cabbage | 3 | 1 | 1 | 10 | 2 | 4 | 2 |
| Tomato | 2 | 18 | 1 | 3 | 2 | 1 | 7 |
| Slippery cabbage | 6 | 106 | 5 | 30-177 | 11 | 18 | 58 |
| Moringa leaves | 7 | 146 | 11 | 49 | 5 | 10 | 65 |
| Amaranth leaves | 9 | 160 | 6 | 31 | 6 | 32 | 17 |
| Jute mallow | 10 | 188 | 12 | 21 | 0 | 36 | 36 |
| Nightshade | 8 | 101 | 13 | 10 | 9 | 21 | 28 |
| Vegetable cowpea leaves | 8 | 198 | 6 | 27 | 3 | 54 | 101 |

*red numbers indicate high levels of nutrients; RE = Retinol Equivalent; α-TE = α-Tocopherol

Source: RNI – FAO/WHO 2004; nutrient data – USDA Nutrient Database, WorldVeg.

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References: **www.rural21.com**

Women selling giant crickets at a market in Mandalay, Myanmar.

Photo: Sarah Nischalke

# Insects for dinner?

**Insects are an important source of protein for many people in the Global South. From an environmental perspective, too, they are increasingly being viewed as an alternative to conventional livestock rearing. However, the potential of insects to improve both nutrition and livelihoods is still far from being fully utilised. The ProciNut project seeks to change that.**

**By Sarah Nischalke**

Since the EU's Novel Food Regulation entered into force in 2018, insects as a novel food have become a talking point both in Europe and elsewhere. At least, many people in the Global North have probably tried insect pasta or protein bars so that they can join in the conversation. However, insects have yet to feature regularly on our everyday menus. In many countries of the Global South, on the other hand, insects have traditionally made an important contribution to people's diets and are a normal part of the food culture. For many small-scale farmers – especially women – they are also an important source of income. People living in rural areas often eat little meat: although almost all smallholders keep animals, they usually sell them, need them as a form of social security, or slaughter them only for special occasions. Insects are therefore a welcome source of additional high-quality protein. And they supply families not only with protein that contains all the essential amino acids but also with a range of micronutrients and vitamins. Their energy value is comparable to that of the meat of mammals and birds, with a protein content of 30 to 60 per cent.

## Tapping the potential

The consumption of insects has been documented in 118 countries, with the number of insect species that are used as food totalling around 2,100. Most of these species are beetles, hymenoptera (bees, wasps and ants), grasshoppers and butterflies. In terms of environmental impact, too, insects potentially have major advantages over conventional livestock because they have a very efficient feed conversion rate, produce few greenhouse gases (especially at the warm temperatures which form their preferred living conditions) and need little space and little water.

The ProciNut project (Production and processing of edible insects for improved nutrition; see Box on page 22) is seeking to disseminate knowledge of the benefits and techniques of insect production and processing in East Africa and South-East Asia, with a focus on Madagascar and Myanmar. Until now, almost all the insects eaten in these countries have either been collected in the wild or – in the case of Myanmar – imported from Thailand and China. The project wants to train interested small-scale producers in insect production, establish the first marketing pathways and also use insects to make local snacks. Caca pigeon, for example, is a very tasty salty cracker from Madagascar that could be made from cricket flour. In Myanmar, shrimp powder (Pa-Zon Chauk Mhont) is traditionally sprinkled on food by almost everyone, and insect flours could be used in the same way. The project's long-term goal is to improve the access of local communities to sources of protein and open

up an additional income option for these communities. An essential element of the project is awareness-raising at political level, among the advisory services and at the key universities to alert these bodies to the potential of insects in nutrition and as a source of income. This work is conducted mainly via training sessions and policy dialogue meetings.

But what are the details of insect consumption globally? With the exception of Thailand and China and, recently, the Global North, most of the insects that are eaten are collected in the wild or caught by professional insect collectors using light traps and similar technology. In rural areas, collecting usually involves the whole family and is often combined with other activities, such as gathering firewood or harvesting wild plants. At times of insect plagues, the creatures are also collected from the fields and then prepared and eaten or dried and fed to animals. But it would be inappropriate to class insects as a rural food or a poor person's meal. Insects are sold in the markets, where they command higher prices than fruit and vegetables and are often more expensive than some meat and fish, and they are served in restaurants in a wide range of price brackets. For example, at the market in Myanmar a portion of giant crickets (50 insects) costs 7,500 kyats (equivalent to 4.40 euros), while in the "Insects in the Backyard" restaurant in Bangkok, a main course such as cricket pasta with pesto and silkworms sells for between 10 and 15 euros.

## Linking tradition and modernity

The term "traditional" could lead one to suppose that insects are eaten mainly by the older generation but here, too, practices vary widely between regions. When our interview partners in Myanmar were asked whether children and the younger generation rejected eating insects as old-fashioned, they stated that children never refused insects when offered them and that for many they were one of their favourite foods. In urban areas – especially in central Myanmar, where eating insects is less common, and in Thailand – there are signs that young people who have not grown up with edible insects are returning to the old food traditions. They sit in a bar in the evenings and enjoy crisply roasted giant crickets with their beer or order home delivery of a portion of silkworms dressed with garlic or herbs.

In the urban areas of Madagascar, on the other hand, there is a noticeable divide between the generations. The older generation have grown

A helping of bamboo borer at the Crokmai Thai Lao Restaurant, Bangkok.

Photo: Ingo Wagler

up with edible insects and associate them with positive childhood memories, while members of the young urban generation, if they accept insects at all, want them on their plate only in processed form. By contrast, interview partners across all age groups in Myanmar and Thailand stated that it was precisely the crisply roasted insects' bodies that made them appealing to eat and that the sensory experience was lacking when insect flours were used.

## Culture and religion play a significant role

Eating insects is not the preserve of specific social classes, but it often has an ethnic dimension and cultural and religious aspects also come into play. In the Global North, there is no tradition of eating insects, while in the Global South it is often certain ethnic groups – and not necessarily marginalised or poor ones – that generally eat insects or eat a particularly wide range of them. In Myanmar, for example, an especially diverse range of insects is eaten in the region bordering Thailand and China, where culturally, too, the practice is associated with certain ethnic groups. Farmed insects are also widely accepted there, and people are aware that production is actually possible and can be lucrative. The largest ethnic group in Myanmar, the Barmar, who live mainly in the centre of the country, do not traditionally eat insects and the interview partners state that, in line with the current trend, they eat "only giant crickets".

As a result of the Buddhist belief that killing animals is associated with bad karma, followers of Buddhism are particularly likely to have reservations about insect production and reject the "mass killing" of insects. In the region bordering Thailand, where Buddhists live among other religious groups, this attitude is less pronounced and does not present an obstacle. The project's first training programmes and trials therefore focus on this region of Myanmar (Shan and Kayin states). In other parts of the continent, such as South Asia, insects are generally regarded as an unclean food, and eating them is widely seen as a backward practice; insects tend to be eaten only by marginalised ethnic groups such as the Adivasi or only in particular areas, including large parts of the Indian north-east. Followers of Hinduism and Islam refuse to eat insects. Religious affiliation thus plays a significant role.

## Why insect rearing instead of collection?

There are good reasons to prefer insect rearing over collection in the wild. In some cases, it is the females of the insect species (such as giant crickets and water beetles) that carry eggs in their abdomen that are a particular delicacy and fetch very high prices. But the rise in urban consumption and professional capture is putting insect populations under growing pressure. Another problem in relation to the consumption of insects gathered in the wild is

### THE PROCINUT PROJECT

The ProciNut project (Production and processing of edible insects for improved nutrition) at the Center for Development Research (ZEF) at the University of Bonn, Germany, is researching the edible insect sector in Madagascar, Myanmar and Thailand. The project runs from mid-2018 to mid-2021. It is financed by the German Federal Ministry of Food and Agriculture (BMEL) and implemented in cooperation with local universities.

The first trials of the production of local insect species were successful. For example, feeding experiments were conducted at the local universities with wild silkworms, grasshoppers and giant crickets. In all three countries, policy events and initial training sessions for smallholders have been held. Interest in insects as a livelihood option has been shown not only at the political level but also by development organisations such as Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the Danish International Development Agency (Danida). The local universities have initiated other insect projects on their own, too.

Smallholders getting cricket training in Kengtung, Myanmar.

Photo: Jochen Dürr

that they may be contaminated by the accumulation of chemicals used in agriculture.

For this reason, as well as on economic grounds, the Thai government was prompted some time ago to start providing significant support to the insect sector as a branch of the economy. Training centres were set up and consumer awareness was raised through tasting opportunities. The aim was to popularise insects that are particularly suitable for farming but not yet a preferred food – in other words, to align people's tastes with production. In Thailand in the 1990s, giant crickets were favoured as a food. The smaller cricket species (house crickets, field crickets, etc.) are now much more commonly eaten, because their short life cycle and simpler rearing requirements make them more lucrative, and in taste and consistency, they are a delicious alternative to their larger relatives.

In Madagascar, too, there is significant political support. The Ministry of Agriculture is very interested in insects as a source of both food and feed; as a result, insects are even included in the National Nutrition Plan and promoted both nationally and regionally by the Office National de Nutrition (ONN), which has therefore become an important project partner. At implementation level, though, small-scale farmers lack the help they need on every front. They have neither the time nor the financial capacity to make even the smallest investment or try out new agricultural activities. At the same time, significant protein deficits in people's diets and widespread poverty make Madagascar the most needy project region. As a solution, attempts are now being made to get microfinance institutions on board.

## The gender aspect

The ProciNut project is also trying to kick-start research into gender aspects in the innovative milieu of edible insect production. Rearing insects requires only a small investment, because they need little space and little food and water. Simple plastic boxes, nets or cement constructions in the backyard are often sufficient. Because the insects can be reared at the back of the house, women are often particularly happy to take up insect production, which combines well with their domestic activities. Whereas the collection of most insect species can be done by all household members, harvesting some species may be a strenuous physical task and is mostly done by men. Chopping up bamboo canes to collect bamboo worms and setting up light traps to attract giant crickets in Myanmar, for example, are tasks performed entirely by men.

It is not only small-scale production that is frequently dominated by women. The marketing and processing of edible insects also tends to be their preserve. This is a reflection of the fact that in the Global South, it is usual for certain types of production – such as growing fruit, vegetables and field crops or tending livestock – to be performed either mainly by women or mainly by men. Edible insects tend to be regarded as a job for women (with the exception mentioned above). However, in small-scale farming in the Global South, it is also frequently noticeable that as soon as an innovation that involves women reaches a certain level of profitability and exceeds the household's own requirements, it is taken over by men and scaled up.

## A great potential, but still a lot to do

One of the project's most important realisations is the fact that people who eat and collect insects are not automatically interested in producing them. There is a widely held view that insects gathered in the wild are of better quality, and many people are unaware that farming insects is even possible. In both project regions, production is still at a very early stage, and a great deal of educational work is needed to make people aware of the advantages of including insects – which they are already eating – in their diet and to raise awareness of the opportunities and potentials of insect production. Extensive research is also needed into the suitability and cost-effectiveness of local species and the best production conditions for them.

While the specific findings on local species are only to a limited extent transferable, lessons learnt with regard to the establishment of the insect sector are also of great interest for other countries. A basic requirement for the successful development of the sector is the cultural acceptance of eating insects. Conventional animal husbandry is based on centuries of experience, while scientific knowledge of insect use is still in its infancy. The opening up of the Global North to edible insects (keeping in mind that the potential for feed insects in meat production is significantly higher) and the emerging trends in the Global South could provide considerable impetus for the further development of the insect sector.

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# Small fish with a big potential

**African inland fisheries are increasingly reliant on the capture of small fish species that are sundried and traded to reach consumers often at large distances away from where they were produced. Largely unrecorded, the "hidden catches" go a long way in alleviating "hidden hunger": as they are consumed whole, small fish are an important source of micronutrients for many Africans. Only that, unfortunately, politicians haven't yet realised this.**

**By Paul van Zwieten**

Capture fisheries are an important economic subsistence activity all over Africa, supporting 200 million Africans directly or indirectly through food and income. While conspicuously absent in global debates about food security, small indigenous fish species have always played an important but unrecorded role in African food systems. Along the shores of rivers, swamps, lakes and ponds, fishers, mostly women, can be seen fishing with baskets or small lift nets lined with mosquito-netting, catching a host of small fish species "for the pot". Of the 3,500 African freshwater fish species, 60 to 70 per cent do not grow larger than 15 cm, but most have small populations. Around four decades ago, many African lake fisheries saw a shift from targeting larger catfishes, carp, and tilapia to include large catches of open water species such as small freshwater herrings, carps and characins that do attain large population sizes. In dried form, these fish find their way to the markets of any African city. Kapenta caught in Lake Kariba, Zambia, is traded in Johannesburg, Dagaa from Lake Victoria is found in Juba, South Sudan, and the pygmy herring from Lake Volta, of only 3 cm maximum length, is hawked in small plastic bags as "one-man-thousand" on the streets of Tamale in northern Ghana. Sold in small quantities and eaten whole, small fish are accessible to many households and are thus an indispensable source of animal protein and micronutrients in many African societies.

For many women, selling small fish is an important source of income.

Photo: Anne Regtien

## Fisheries and species

The recent boom in small fish fisheries targets species that all are highly productive and can sustain very large catches. With high turnover rates, annual biological production of small fish can reach up to six times their average biomass (see Table), meaning that they sustain large catches and can hardly be overexploited with current fishing methods. For example, the largest freshwater fishery in the world is on Lake Victoria's Dagaa. Carried out at night through light attraction, catches reach around 450–550 thousand tonnes annually. To give a sense of magnitude, hypothetically, this catch could provide 25 grams of dried fish once a week to all 144 million inhabitants of Kenya, Uganda and Tanzania. Yet, fishing pressure is still low, and the potential sustainable catch of Dagaa is estimated to be around 2 million tonnes. In a survey of eight large African lakes with more detailed information on ecosystem properties and fisheries, the total potential yield of small fish was estimated at around 5 million tonnes per year, of which only 15 per cent is utilised today. This unparalleled level of production, simple capture methods and reduced availability of bigger species due to heavy exploitation are the main reasons for the recent considerable increase in fishing effort and catch.

## Processing and trade: women's task

In all cases, small species are sundried after landing. Sun-drying is the most environmentally friendly and energy-efficient processing technology available, requiring limited investments to obtain potentially high-quality products. Nevertheless, the main bottleneck in utilising the full potential of small fish fisheries is precisely in this first stage of processing, as drying usually takes place directly on the beaches and lake shores or on nets. Rainy seasons, overheating and mixing with sand and soil cause high quality losses. Fish is re-dried after rainfall, but then becomes unfit for human consumption and enters the animal feed value chain. For example, 60–70 per cent of the Dagaa caught in Lake Victoria is used as animal feed. Simple raised racks or more sophisticated solar-dryers would greatly increase the quality of dried produce but are rarely used in any of the small fish fisheries. Recent work in Kenya and Uganda showed that first-stage processing, mostly carried out by women, on average hardly adds value due to the low prices for low quality fish, thus limiting their capacity to invest. In general, women involved in the small-fish processing sector are constrained by bad working conditions, poor market and transportation infrastructure and limited financial and business services. Strengthening women's capacity to invest would lead to both improvements in nutrition and health for their families and to improved value chains.

Once dried, small fish is packed in large bags and transported by any means possible: bicycles, motorcycles, vans, mini-buses and trucks. The advantages of small fish become especially

**Examples of small, open water fish species in selected lakes indicating their maximum size, current catch, turnover rate (production [P, ton/year] per unit biomass [B, ton]), and extent of regional trade**

| Lakes | Species name (local, Latin) | Maximum size (cm) | Yield (x 1,000 tonnes) | Turnover rate (P/B) | Traded within/to |
|---|---|---|---|---|---|
| **Victoria** | Dagaa, Omena, Mukene *(R. argentea)* | 9 | 510 | 4 | Uganda, Tanzania, Kenya, South Sudan, Rwanda, DR Congo, Central African Republic, Zambia, Zimbabwe, South Africa |
| **Malawi** | Usipa *(E. sardella)* | 13 | 54.8 | 3 | Malawi, Mozambique, DR Congo, Zambia |
| **Tanganyika** | Kapenta *(S. tanganicae, L. miodon)* | 17 | 111.9 | 5 | DR Congo, Burundi, Zambia, Tanzania, Rwanda, Namibia, South Africa |
| **Mweru** | Chisense *(M. moeruensis)* | 4 | 50 | 5 | DR Congo, Zambia, Angola |
| **Kivu** | Sardine *(L. miodon)* | | 16 | 6 | Rwanda, DR Congo, South Sudan, ? |
| **Kariba, Cahora Bassa** | Kapenta *(L. miodon)* | 10 | 30<br>16 | 6 | Zambia, Zimbabwe, Mozambique, DR Congo, Namibia, South Africa |
| **Kainji** | Guimean sprat *(P. leonensis)*,<br>Pygmy herring *(S. leonensis)* | 9<br>3 | 14<br>? | 10<br>? | Nigeria, Ghana, Guinea-Bissau, ? |
| **Volta** | Guimean sprat *(P. leonensis)*,<br>Pygmy herring *(S. leonensis)*,<br>Fangtooth sardine *(O. mento)* | 13 | 102 | ? | Ghana, ? |

clear in this stage of the value chain as they can be packed in large quantities and stored with a shelf life of over six months. Local and regional traders buy directly from the shore and transport to rural, roadside and urban markets at destinations often far from the origin of the fish (see Table). Specialised wholesale markets exist, as for instance the large Kirumba market in Mwanza, Tanzania, or the large fish-markets in Kumasi, Ghana, from where fish is transported to all major towns and again to surrounding rural areas. Low-quality dried fish is re-processed into fishmeal, which is mainly used in poultry feed. The emerging aquaculture industry shuns the low-quality meal and still relies on imports from marine sources. Most of our knowledge here is from the Dagaa value chain. Very little is known about the proportions of small fish of other freshwaters going into human consumption and animal feed value chains.

## Consumption and nutrition

Product diversification is in its infancy. Occasionally packaged salted-dried or deep-fried fish is offered as a snack, while fish-powder is used in baby food or as fortification of porridge served in hospitals. But the heaps of sun-dried small fish that are sold in small quantities to consumers continue to dominate trade and are found in all African fish markets. A recent short online survey in Kenya, focused on urban consumers, found that, despite its slightly bitter taste, more than 50 per cent consumed Dagaa, 80 per cent of those daily to at least once a month, while over 70 per cent bought it at a local market. Like the dried sardine species, which have a sweeter taste, Dagaa usually is cooked as part of a stew that goes with the various staple foods known to African cuisine. While important as an animal protein source, small fish is eaten whole, including bones and intestines, which makes it particularly nutritious as it is rich in numerous micronutrients such as iodine, vitamins B12, D and A, long-chain fatty acids including omega−3, and calcium, iron and zinc. All play a critical role in cerebral development, immune defence and general health.

## So ...

Small fish always have been part of subsistence fisheries in African water bodies, but they are conventionally regarded as of "low economic value" and consequently have low priority in policies. Current fisheries policy, also in Africa, has a narrow focus on productivity gains and economic output, concentrating on international trade and markets. This is reflected in the global food security discourse that does not recognise the nutritional qualities of fish. Sustainable development goals do not mention fish in strategies to combat nutrient deficiencies (SDG 2), while nutrition and food security are not the primary focus of SDG 14, life below water, which, incidentally, also does not mention the freshwater resources that play such a dominant role in African fisheries.

Fish represent by far our biggest source of harvestable protein. Of all food production systems, capture fisheries are the most energy efficient and have the lowest environmental impact in terms of greenhouse gases and use of freshwater, fertilisers or pesticides. Africa relies quite heavily on fish, which forms 18–20 per cent of the animal protein intake per capita overall, including several landlocked countries. Catching small pelagic fish, sundried with a long shelf life, sold in small quantities and consumed whole, is the most high-yielding, eco-friendly and nourishing way of utilising the natural food that aquatic ecosystems provide. Moreover, the unique nutrient content of fish plays a significant role in combating the triple burden of hunger, micronutrient deficiencies and non-communicable diseases. The huge underutilised production potential of small fish could be realised with proper policy attention as well as public and private investments. There is room for diversification of production systems and improved value chains through investments in commercial, technologically advanced and professionally managed chains focused on scale, next to and including a shift to nutrition-sensitive fisheries policies aimed at improving the existing, thriving, African small fish chains.

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# The trend towards healthy diets – an opportunity for farmers and agri-entrepreneurs

**Urbanisation and burgeoning middle classes in many countries are also resulting in new demands on food and nutrition. While some look forward to the availability of imported processed food, others are seeking healthy alternatives provided locally. This opens up new alternatives for small agri-enterprises, as examples of passionate agripreneurs from Togo and Zimbabwe, Indonesia and the Philippines demonstrate.**

**By Bettina Meier**

The food manufacturing sector in many countries has great potential in terms of providing jobs and income for smallholder farmers. Changing household dietary patterns provide new opportunities for local agro-food industries. In Africa alone, demand for processed food has been growing 1.5 times faster than the global average between 2005 and 2015. In many Asian countries, burgeoning urban middle classes prefer healthy, natural food, and locally grown, fresh vegetables, fruits and grains. This opens up new avenues for local entrepreneurs driven by a vision of sustainable agriculture and economy.

## Wholesome and traditional foods in Zimbabwe

Zimbabwean entrepreneur Austin Munyavhi started his company "Utsanzi" 20 years ago. Utsanzi manufactures wholesome foods, cosmetics and medicines made from indigenous plants and herbs, such as grains, oils, butters, teas, dried leafy vegetables, insects and medicinal herbs. We meet Munyavhi in his grocery shop in an upmarket Harare shopping mall in March 2020. "The market for traditional products and herbs is growing", Munyavhi says. "We Zimbabweans eat too much maize and unhealthy foods. In Zimbabwe, there are so many ill people suffering from HIV/AIDS, cancer, diabetes and high blood pressure. Consumption of indigenous herbs and plants can help to maintain good health and prevent illnesses."

Caroline Jacquet is a project manager at Bio-Innovation Zimbabwe, a specialised research organisation that promotes underutilised plant species and links private companies to producers. "There is a wealth of traditional plants and herbs in our country. Collecting and growing those plants and herbs creates new livelihood options and can bring people out of poverty, besides conserving biodiversity and benefiting health", Jacquet agrees with Munyavhi. She is adamant that there is a demand for indigenous products, from the local middle class, from expats in Zimbabwe and from overseas. It is a niche market with strong potential.

### A win-win situation

Munyavhi employs six permanent staff and dozens of casual labour. Not only does Utsanzi provide jobs, it also contributes to household income of small-scale producers and collectors. "We source our products directly from farmers whom we train in good hygiene and manufacturing practices. They benefit, because they have a secure market, and we benefit, because we control the quality of our product", explains Munyavhi. In 2016, Utsanzi won the Global Food Industry Award (issued by the International Union of Food Science and Technology) for its innovative product Zviyo and Nyemba porridge, a mix of finger millet with cow peas. While its nutritious value is uncontested, the porridge didn't sell on the market. "Our business is a walk on the tightrope", says Austin Munyavhi. "I started my business because I believe in the strengths of indigenous African food, and I know the refined maize and other processed foods make us sick. But I soon came to realise that I can only sell what people are prepared to buy. Therefore, consumer education is very important."

Austin Munyavhi speaking at a workshop.

Given the moribund state of Zimbabwe's economy, it seems a miracle that Utsanzi keeps going. The company's savings have dwindled because of hyperinflation, and frequent power cuts mean that they mostly produce at night-time. To make things worse, Utsanzi's suppliers have been badly affected by severe drought. Also, Munyavhi says, government policy favours maize over small grains. "The gazetted maize price is consistently higher than that for small grains, so there is little incentive for farmers to shift from maize to millet."

Nevertheless, Munyavhi has effectively steered his business to success. "It was a long way, but with a lot of perseverance and a strong vision we have made it into the mainstream market", he notes. "Today, we run our own grocery shop, and our products are sold in supermarkets nationwide."

## A bakery family business in Togo

Similar to Zimbabwe, the economic framework in the West African country of Togo is not favourable to small-scale agri-food industry. The bakery Valk Vivi, a family business, is located in the Kégué quarter of Togo's capital Lomé. We visit the company in May 2019 and speak to co-owner Stanislas Kouegah-Chouchouda. "Since my great-grandmother Victoria Akouavi Logo Kouegah started the bakery 60 years ago, it went from generation to generation. We have ten different products. Our bestsellers are coconut balls, ginger cookies, and biscuits based on soya, maize and manioc. All products are

Stanislas Kouegah-Chouchouda in his bakery.

certified, and we have a solid customer base. I am also very proud that the whole family works in the business."

They produce delicacies and biscuits made from different locally available flours as well as from coconut, plantain and ginger. Valk Vivi employ 15 staff, most on a permanent basis. They operate from the family home, using a traditional clay oven. Their most valuable assets are the minivan used to buy supplies and for deliveries and the electric heat sealer for the packaging. Recipes are kept strictly confidential. The mixtures are prepared in a sealed separate room where only family members have access. Valk Vivi had some bad experiences with employees turning into competitors.

**Consistent quality enhances a good relationship with costumers**

Similar to the Zimbabwean company Utsanzi, Valk Vivi have successfully entered the local mainstream market. They sell to wholesalers who even come from neighbouring Benin, Ghana and Burkina Faso. They also get orders for marriages and funerals, and they sell to local vendors. "Each morning, we set off to the central market with our small truck, and distribute the biscuits to the vendors", explains Kuegah-Chouchouda. Valk Vivi products are also found on supermarket shelves in Lomé, although their customers tend to prefer imported biscuits. "There is a preference for wheat-based biscuits; products made from locally produced manioc don't sell as well. Although the government runs a scheme to promote locally grown manioc, consumers do not follow suit. There is more advocacy needed to promote the local crop."

Consistency and a good reputation have kept the company going, although it has not been growing much. Costs for certification and taxes are a heavy financial burden. The company cannot access commercial loans, and it is too big for micro-finance. So it does not have the financial means to buy machinery that would enable scaling-up of the production and making it more environment-friendly. Still, the mere fact that Valk Vivi have survived over the years and has provided a steady income to its owners and employees is an outstanding achievement given the context in which they operate.

## Organic vegetable production in Indonesia

Let's move to Asia. Here, in many countries, a health-conscious urban middle class provides a growing market for organic food that is perceived to be more safe and nutritious than conventionally-grown products. Organic vegetables, fruits and grains are generally available in supermarkets and specialised shops. Direct marketing via Facebook and What's App as well as basket selling are also quite common.

Yogyakarta is a buzzing city in Indonesia's densely populated main island of Java. In 2006, then-journalist Untung and his friend Sugiharto founded the social enterprise Tani Organic Merapi (TOM). "Untung means luck and Sugi means money; this deemed to be a good combination", Untung told me smilingly when I met him in October 2017. "My parents were farmers, so I know what I am talking about", says Untung. "The soil in Java is badly degraded due to chemical inputs and pesticides. Agriculture is not attractive to young people, it does not pay. When we started TOM, we wanted to change this. In addition, we were concerned with the bad eating habits of our co-citizens. There are many illnesses because of bad diets. A friend of mine died at age 27 from a stroke – we attributed it to his diet. So I decided to quit my job and start something meaningful that would at the same time provide a good living for my family and the farmers in our community."

**A bumpy start**

Untung und Sugi are idealists. "We didn't start TOM with the intention of making a lot of money. We wanted to contribute to nature conservation, and to help the unemployed youth", they say. In the first year, they made a deficit of 60 to 70 per cent. "It was difficult to find costumers; we had no references", says Untung. But soon the business kicked off. In 2017, TOM has its own two-hectare farm, a processing centre that employs six permanent staff for sorting and packaging and an educational facility. In addition to the vegetables grown on their own farm, TOM has a fixed contract with 115 local farmers that supply the vegetables. The company guarantees the purchase and provides seeds as well as organic fertiliser and pesticides to the farmers. Given the hot climate and the all-present threat by pests and diseases, as well as the short shelf-life of vegetables, maintaining the quality of the product is a continuous challenge. The requirements of the Indonesian Organic

Speaking to producers in the TOM farm. The enterprise has a fixed contract with 115 local farmers that supply the vegetables.

Standard have to be fulfilled, as certification is a prerequisite for retail selling. "How do you maintain the standard?" I ask. "We hold regular meetings with our partner farmers", Untung explains. "A good relationship with the farmers is very important. Our business requires commitment and consistency of the organic farmers. The quality of the packaging is also important."

**Changing the market through consumer education**

As Austin Munyavhi in Zimbabwe, Untung has a strong educational mission. "The mindset of the people must be changed", he says. In the education centre at TOM's farm and processing plant, students, school pupils and tourists are taught about healthy diets. "Education is a means to change the market", insists Untung. "Farmers' practice will only change if more customers are asking for healthy, natural products." And what about the business? "The organic market is growing every year. We are currently offering thirty-five different vegetables", Untung states. "There is a tremendous demand for fresh vegetables, and often we have to turn down requests. For example, there is a high demand for oregano at the moment that we cannot meet."

Farmers have doubled or tripled their income since they started supplying TOM, they tell us. With the organic certification, they achieve a much better price than with conventionally grown vegetables. They also keep some of their harvest for their families, with benefits to their own health. TOM has contracts with several supermarkets and hospitals. The supermarkets place their orders on a day-to-day basis. Planning the production and anticipating the demand is a fastidious task. But Untung and Sugi are satisfied with their achievements. The success of their business strongly supports their advocacy work, and that is what counts for them at the end of the day.

## Urban organic farming in the Philippines

Similar to TOM's owners, the founders of Peñalosa Farms in the Philippine island Negros Occidental are strongly driven by a mission: to show that integrated, organic farming can be done on small plots and generate sustainable incomes. We visit the farm in November 2017. "Welcome to Peñalosa Farms – where mother nature and father business can rock and roll", says a poster at the entrance. The farm, located in Victorias City, near the island's capital Bacolod, is both a commercial venture and an educational facility. On just one hectare of land, Peñalosa Farms is home to three hundred crop species, livestock, poultry and fish. Ornamental plants and medicinal herbs thrive in hanging gardens, mushrooms grow in containers; a fresh breeze smoothens the oppressive heat in the open tree house that hosts the learning centre.

Visitors taking part in a guided tour on Peñalosa farm, which is both a commercial venture and an educational facility. Photos: Bettina Meier

> "No Filipino should go hungry in his own native country!

**A strong value base**

Ramon Peñalosa started the farm when he unexpectedly inherited the small plot of land in his home town. "At the time, it was used as a parking space for buses", he recounts. A devout Christian with a strong concern for the environment and a deep social conscience, he and his wife decided to convert the land into an organic farm. Youth in the Philippines are increasingly turning their backs on subsistence agriculture. At the same time, there are lots of people who want to buy healthy, homegrown food, not the stuff that is imported from Vietnam or Thailand. So the Peñalosas embarked on their mission: No Filipino should go hungry in his own native country! "Our country is very rich in natural resources", Peñalosa insists. "But our farmers are poor. Why is that so? There is money in the countryside! Farmers in the Philippines must start to conceive themselves as agripreneurs. As long as they only think about production, and not about the market, they will remain dependent, and prone to exploitation."

Strong family values, as with the Valk Vivi family in Togo, are a key ingredient of the Peñalosa's success. All five grown-up children of the family work in the business. They are driven by their conviction that food production and food industries must be changed for the sake of people's health, for the benefit of nature conservation and for the benefit of the local economy. "We must go the Filipino way, doing our own integrated organic agriculture with our own indigenous resources." In this regard, they very much echo Austin Munayvhi's mission to better use and celebrate Africa's unique natural resources and ingredients.

All enterprises featured in this article share their vision of strong food systems based on indigenous resources and production that is geared towards the local demand. They show that changed dietary patterns really do provide business opportunities for entrepreneurs and farmers. They all use a business approach to achieve an ulterior goal while creating employment and sustaining incomes for smallholder farmers. And, most importantly, they are passionate about their endeavours.

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References: **www.rural21.com**

# Nutrition and health: farming women in Kenya's Murang'a speak out

**As a rule, women play a major role in determining household dietary practices and nutrition. In agricultural rural areas, they are actively involved in food production as well, and thus also play a crucial role in terms of food availability. But what are the factors determining the dietary practices which women opt for? And is it important whether they engage in organic or conventional farming?**

**By Irene Kadzere, Anne W. Muriuki, Christian Schader, Marlene Heeb and Isabelle Herter-Aeberli**

Kenya is among the triple burden global hotspots for malnutrition given its high levels of childhood stunting, anaemia and the growing problem of overweight in adult women (Global Nutrition Report, 2018). While women are a vulnerable group nutritionally, they are long known to play a major role in determining family/household dietary practices and nutrition in both rural and urban settings of Kenya. In agricultural rural areas, they are directly involved in family food production and in making choices and decisions on food procurement and preparation for their families. Organic agriculture has been gaining importance among women and men farmers in Kenya, but there is scarce information on the role that organic farming plays regarding transformative sustainable nutritional practices, decisions, and fulfilment of healthier and safer diets among smallholder farming families in Kenya. A project on dietary diversity and nutrition (see Box on page 31) takes a look at these aspects.

Some of the women farmers from Murang'a County who participated in the Focus Group Discussions, together with the discussion facilitators and the Nutrition Officer from Kigumo Sub-County.

Photo: Irene Kadzere

In the course of the project, we held Focus Group Discussions (FGDs) in December 2019 with farming women 'perceived' as practising organic farming though not being certified (herein referred to as organic) and conventional farming women (3 groups with 12-15 farmers each for each category) from Murang'a County in Kenya. Subsequently, individual interviews were conducted with a selection of farmers from the county. The objective was to understand the prevailing situation regarding household nutrition (food types and sources, roles of women and some decision-making processes), perceptions on nutrition – the health/food safety – agriculture nexus, and information needs related to nutrition and health.

## Overview of findings in relation to human nutrition and health

**Organic or conventional.** The women farmers were first of all asked why they practised organic or conventional farming. Clear differences emerged regarding the reasons, which we clustered as "health risks", "production related reasons", "status quo and knowledge of alternative farming practices", "environmental protection" and "marketing prospects". They are given in the Table on page 30.

**Food production and purchase.** As to the important types of household food crops (excluding tea) and livestock spontaneously mentioned in their top ten lists, there were no striking differences between the organic and conventional farmers. Maize was the most important cereal food crop followed by cabbage, common beans, and kales (other than cabbage). The top three types of livestock reared for food and income were cattle, chickens and goats/sheep. The top ten foods most purchased by both organic and conventional farmers could be categorised into legumes, vegetables, tubers, fruits, cereals, oils, sweeteners, condiments, beverages and meats.

**Most nutritious foods and terms mentioned to define human nutrition.** Foods perceived spontaneously as the most nutritious for women were from the following food groups: legumes (e.g. black beans, pigeon peas, groundnuts), vegetables (including some traditional ones such as amaranthus, pumpkin leaves and African nightshades), tubers (e.g. arrowroots, sweet potatoes, yams, cassava), fruits (e.g. cooking and dessert bananas, avocadoes, apples, oranges) and cereals (e.g. unrefined maize flour and mixed flours porridge). Although among the most purchased, meat (and other animal products) was, surprisingly, not frequently mentioned spontaneously. The organic and conventional farmers used more or less similar terms to define human nutrition, except that organic farmers also mentioned 'foods that do not contain chemicals'. The term 'balanced diet', with or without a specification of nutrients such as carbohydrates, proteins, vitamins, etc., was mentioned by all the groups. Other terms used referred to energy-giving food, health and/or disease resistance, consumption habits, food utilisation and good body growth.

**Priority to food consumption in the household.** All the organic and conventional groups indicated that women had the primary responsibility to prepare and share food in a household. In cases where the women were sick, the men could prepare the food. On the other hand, women had the lowest priority

**Reasons given by the women farmers for using conventional or organic farming**

| Clustered category | Organic farmers | Conventional farmers |
|---|---|---|
| Health risk reasons | Conventional farming inputs (synthetic chemicals) have brought about some diseases besieging humans – organic production is good for their health and that of their families since it reduces potential exposure and intake as well as accumulation of agrochemicals in their bodies. | |
| Production-related reasons | | **Crop growth**<br>• Crops in organic farming grow slowly, e.g. a maize crop with manure only does not grow well. The conventional inputs help crops to grow faster and better, and boost yields.<br>• Organic farming demands more labour for, e.g., cutting grass, making fertilisers (compost/manure) and manual weeding.<br>• With chemical fertilisers, one just buys and applies them in the field – it is easier.<br>**Controlling of pests and diseases**<br>• Ability to control pests and diseases such as the Fall Armyworm in maize and blight in potatoes and tomatoes.<br>• Crops like cabbage suffer from many pests and need good pest control. |
| Status quo and knowledge of alternative farming practices | | • Some farmers adopted the farming practices that they found when they got married, and no one has informed them of alternatives.<br>• Other farmers have not tried using organic farming practices, and small land areas cultivated with food crops restrict organic farming requirements. |
| Environmental protection | • Protect the environment by not using harmful chemicals in farming.<br>• Eliminate all chemical residues in the soil.<br>• Organic management revives/restores and maintains the fertility of soils.<br>• Revive biodiversity – e.g. many worms, black ants and different types of weeds (diverse) are found in organic plots/fields. | • To keep the land fertile, one has to use manure and combine this with chemical fertilisers to be able to attain higher yields.<br>• Manure improves soil structure. |
| Marketing prospects | • Organic products are more marketable, but not all farmers sell their crops. Profits are still not very attractive, but once customers know about the organic farms and products such as arrowroots or vegetables, they come directly to purchase such organic products. | |

when it came to serving food, giving their husbands and children, respectively, higher priority except when guests were present, in which case they would be served before the husbands and children. This practice has potential implications for nutrition adequacy for the women during periods of hunger, when families do not have enough to serve and/or consume.

**Perceptions on food safety, and concerns.** The women's perceptions of a safe food showed some similarities and differences regarding the organic and conventional farmers. Both categories considered own-produced food (or food from organic farming neighbours in the case of the organic category) as the safest, as they could 'guarantee' the production, preparation, ingredients/additives, and hygiene practices. However, it is noteworthy that even some conventional farmers perceived foods grown without chemicals to be safer. On the other hand, the conventional farmers also pointed out that the food which they produced using synthetic inputs was safe, too, because they said that after pesticide application, they refrained from harvesting the crops until the required pre-harvest interval period had elapsed. Food that was properly stored, such as maize grain kept in dry conditions, was also considered safer, as this prevented biological contamination, e.g. from aflatoxins. For purchased foods, some farmers often checked for expiry dates as a safety precaution. When it came to the safety of foods produced by other farmers, all groups clearly raised concerns regarding the safety of such foods. Primarily, they all did not trust, i) what (and when) had been applied to the food during production or storage – whether the food was agro-chemical free or contaminated, ii) the hygiene and handling of the food, iii) storage practices, and iv) the risk of undesirable ingredients having been used. Even the conventional farmers were also wary of the potential risk of other producers failing to observe the safe intervals for harvest after spraying.

**Factors affecting the choice of food to prepare a family meal.** Both organic and conventional farmers mentioned quite similar factors influencing the choice of foods to prepare for meals. The first spontaneous response from both groups was 'prepare what is available'. Other factors taken into consideration related to:

- varying the foods to ensure a variety of nutrients and avoiding monotony;
- time taken to prepare foods, and available time – whole grains take longer and require more energy to cook and are hence not favoured when time and/or energy are constraints;
- affordability – cost/price of purchased foods;
- family needs/preferences (including demands from children);
- health restrictions – e.g. for diabetics;
- choose what is pleasing to cook;
- follow a certain menu plan;
- freshly cooked food versus leftovers.

**Perceptions on potential nutrition and health impacts of agriculture.** From among a provided list of human diseases, mostly non-communicable, cancer was the most feared in general by both farmer categories during the subsequent individual interviews. Food production practices which were perceived to lead to cancer were avoided by organic farmers – indeed, conversion from conventional to organic was motivated largely by human health concerns. This finding is in

**Perceptions on potential nutrition and health impacts of agriculture**

**Organic farmers**
- No risks related to agrochemical use and exposure.
- Peace of mind: people growing their own food do not stress about where to get food from.
- Physical exercising through activities such as manual weeding, hence one can also keep fit.

**Mentioned by both categories of farmers**
- Back pains, joint and leg pains due to too much work and prolonged bending and/or standing.
- Accidental physical harm from tools.
- Arthritis from cold environments, e.g. prolonged standing in tea plantations.
- Allergies – pollen from maize plants and napier grass.

**Conventional farmers**
- Agro-chemical risks included: breathing difficulties, chest pains, sneezing, asthma, headaches, skin conditions, stomach upsets, vision impairment, fertility (reproductive) impairments.
- Kales grown with synthetic fertilisers can cause acid when consumed.

line with the increasing incidences of various types of cancers in Kenya, some of which are diet-related, according to Maiyoh and Tuei (2019). Some responses were specific to either farmer category; see the left and right boxes above. Organic farmers mentioned some positive links, while conventional farmers spontaneously referred to negative attributes. In the middle box, the responses that were common among both categories are highlighted, and relate to the strenuous nature of smallholder farming, possible accidents and allergies.

## A strong need for information

The focus group discussions and interviews revealed that information on nutrition and health was in high demand among the women farmers. Their questions and information needs can be clustered as follows:

- how to eat well (balanced diet) and remain healthy and slow down ageing;
- appropriate nutrition for various age groups and diseases conditions (e.g. cancer, diabetes) including disease-preventing foods;
- reduction of agrochemical accumulation in the body and environment;
- maintaining or attaining good body weight and boosting immunity;
- good food preparation methods – maintaining/preserving nutrients, food compatibility, etc.;
- knowing what and how foods contribute to nutrition and how to combine them for a meal;
- special diets, e.g. for diabetics;
- capacity development – eagerness and keenness to hear about the outcomes of the FGDs and to receive future information and training on nutrition/health topics;
- appropriate eating schedules and meal portion sizes;
- how to check one's nutrition status and recommend a meal plan;
- how to promote healthy eating among the younger generations – reducing consumption of junk food.

Organic farmers specifically mentioned the need to detoxify chemicals which they believed accumulated in their bodies over the years when they consumed conventionally grown food. Some conventional farmers also wanted to know how to convert to organic farming. It is not surprising that both farmer categories brought up weight control-related information needs. In Kenya, overweight and obesity are increasing, and are driven to a large extent by the transitions and shifts in nutrition from traditional diet patterns high in fibre and micronutrients to westernised diet patterns high in salt, fat (energy dense) and refined carbohydrates, but low in fibre and vital micronutrients.

## To sum it up

The interviews revealed that organic and conventional farming women from Murang'a, Kenya, produce largely similar crops and livestock types and purchase more or less similar types of foods. However, it also became clear that different aspects come to bear in their choice of production modes. Whereas human and environmental health considerations, food safety (chemical-free food) and market prospects appeared to be key motivating factors for organic farming, those among conventional farmers included the need to boost crop yields through use of agrochemicals and synthetic fertilisers while reducing labour inputs into farming. Cancer was the disease most feared by both organic and conventional farming women, and the link between food production practices and health spanned the chain from production to consumption. Furthermore, it was revealed that the women are keen to learn and receive information and training on a wide range of nutrition and health-related topics.

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In Murang'a County, the Swiss Research Institute of Organic Agriculture (FiBL) and partners in Kenya such as the Kenya Agricultural & Livestock Research Organization (KALRO), the International Centre of Insect Physiology and Ecology (icipe) and the Organic Agriculture Centre of Kenya (OACK) have been conducting comparative research on productivity, profitability and sustainability of organic and conventional smallholder farming systems through the Farming Systems Comparison in the Tropics, ProEcoAfrica and Organic Food Systems Africa (OFSA) projects.
More information: https://systems-comparison.fibl.org; www.proecoafrica.net

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# Eat less meat: if only it were that simple

**"Eat less meat" is seen by many as a way of improving the health of the planet and its people. But the issue isn't quite so simple – at least where the nutrition security and livelihoods of millions of people in the Global South are concerned. A call for a holistic view.**

**By Lawrence Haddad**

It is not surprising that there is so much controversy swirling around the consumption of animal-sourced foods. First, different types of animal-sourced foods have different impacts on different types of nutrition outcome. Second, different types of production of different types of animals have a differential impact on greenhouse gas emissions and the use of natural resources. Third, animal production is an important livelihood strategy for many of the poorest individuals in the poorest countries. Fourth, there are important zoonosis spillovers from the clearance of land that wildlife depend on as well as food safety concerns from the improper handling of animal-source foods. Finally, animal welfare is a key issue in its own right, and different production systems have different impacts on animal wellbeing. Animal-sourced food production sits right at the heart of these overlapping issues, which often entail significant technical and political trade-offs between different goals and different groups of people.

In terms of nutrition outcomes, those who eat high levels of animal-sourced foods would be well-advised to temper their consumption. Most national food-based dietary guidelines recommend moderating the consumption of red meat in particular, and the vast majority of guidelines advocate decreasing the consumption of processed meats as they have been identified as a risk factor for some diet related non-communicable diseases. Those who eat high levels of animal-sourced foods tend to be relatively well off because such foods tend to be more expensive and aspirational than plant-based foods. For those with low incomes, and especially infants and young children, the recommendations are to consume more animal-sourced foods since they are good sources of vitamins and minerals and are highly bioavailable and usable by the body's metabolic processes. The consumption of these types of foods has been shown to be significantly associated with reductions in under-five stunting, and in its 2020 *State of the World's Children*, UNICEF laments the low consumption of these foods for under-five children with poor diet diversity scores.

The high rate of greenhouse gas emission from the production of some types of ani-

**Health, environmental and livelihood dimensions of animal-source foods production**

| | | Dairy | Eggs |
|---|---|---|---|
| Health outcomes | Iron-deficiency/ anaemia | Neutral | Slightly reduces |
| | Micronutrient deficiencies | Reduces | Reduces |
| | Stunting | Reduces | Reduces |
| | Diabetes, cancer, heart disease | Likely reduces or neutral, but contested | Likely reduces or neutral, but contested |
| Environmental outcomes | GHG emissions | Moderate | Moderate |
| | Other environmental factors | Moderate to high | Moderate |
| Livelihoods | Poverty reduction, economic development | Important | Less important (production more industrialised) |

Source: GAIN discussion paper series 5

mal-sourced foods has led to many in the media to call for a plant-based revolution in diets. "Eat less meat" is seen as a way of improving the health of the planet and its people. However, eating less meat would harm the health of some individuals in low-income contexts, especially children under five and low-income populations with a higher nutrient requirement, such as women of reproductive age and female adolescents. It is the higher income households – in all contexts – who would do well to reduce their consumption of animal-sourced foods for the sake of greenhouse gas reduction. "Eating less meat" would also harm the livelihoods of many low-income populations who depend on livestock, poultry and fishing. Rather, reductions in greenhouse gas from animal-source production could be achieved by more efficient production systems in low-income contexts, where animal wastage is highest.

The challenge, then, for high-income countries is to reduce the consumption of animal-source foods (for their own health), and the challenge in lower-income countries is to improve the efficiency of animal source production (for the sake of the planet's health). For middle-income countries, the challenge is to improve on both dimensions.

The food system community is coming to the realisation that these goals – and others such as food safety, the reduction of zoonotic risks and animal health – are tightly connected. Much as different types of human rights are viewed as indivisible, we need to begin thinking and acting as if these different goals were indivisible. This is not to say that there are not trade-offs within and between countries when it comes to achieving them.

Decisions about food production and food consumption need to be informed by these trade-offs as well as the synergies. This points to a need for a significant increase in research that explores the attainment of these goals simultaneously, particularly for middle- and low-income countries because most of the limited evidence is from Europe and North America. The trade-offs and synergies are not only technical issues, they are also political. Different constituencies have different interests and different power. The technical and political economy issues also have to be identified, analysed and navigated within a multi-goal framework if food systems are to be transformed for people, animals and the planet. This is the challenge for the UN Food Systems Summit of 2021, and it is the challenge for all of us before – and after – the Summit.

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> EATING LESS MEAT
>
> would harm the livelihoods of many low-income populations who depend on livestock, poultry and fishing.

For further reading, please see:

**https://www.gainhealth.org/resources/reports-and-publications/gain-discussion-paper-series-5-role-animal-source-foods-healthy-sustainable-equitable-food-systems**

**and consumption**

| Animal-Source Foods | | | |
|---|---|---|---|
| Fish and Seafood | Meat | | |
| | Unprocessed red | Processed red | White |
| Slightly reduces | Strongly reduces | ?? | Slightly reduces |
| Reduces | Reduces | ?? | Reduces |
| Reduces | Reduces | ?? | Reduces |
| Reduces | Likely increases, but contested | Increases | Likely neutral |
| Moderate (with wide range) | High, but highly variant by setting/system | High, but highly variant by setting/system | Moderate |
| ?? (highly variant) | High, but highly variant by setting/system | High, but highly variant by setting/system | Moderate to high |
| Important but geographically concentrated | Important | ?? | Less important (production more industrialised) |


Zipline staff member Michael doing a final check of all data before putting the consignment of blood conserves into the drone's cargo hold.

Photos: Jörg Böthling

# Lifesavers from the air

**The prompt arrival of blood and medical supplies can mean the difference between life and death. In regions with difficult access, drones can rapidly cover distances that normally take hours or days. An example from Rwanda.**

**By Barbara Brustlein**

The signal has just come from the radio tower: the sky is clear. No helicopters, no planes. So, no possibility of a collision. Michel takes a last look at the monitor, then counts down the seconds. Then, with a whirring sound, the drone lifts off skywards. In other countries, such as Afghanistan and Yemen, drones are weapons of war. Here, in Rwanda in East Africa, they bring life rather than death: each of the small aircraft carries two batches of blood over the mountains. "The furthest health centre that we can reach from here is a 45-minute flight away," says Michel, who has just launched the drone. This young man, in his late twenties, studied pharmacy. He regards what has been possible to do in his home country since 2016, with the aid of Zipline, a start-up from California, as a minor miracle. "It used to take hours or days for the blood to reach the place where it is used," says Michel. "Now it's only a matter of minutes."

An order from another clinic is just being loaded. At Nyamabuye airfield in a suburb of Muhanga, the second largest city in the country, 45 kilometres by road south-west of the capital Kigali, Michel goes into the little storeroom where his colleagues store blood and medicines in floor-to-ceiling fridges. He checks the contents of the package again, loads it into the drone's belly and places the drone on the ramp. A colleague brings the wings, checks that they are working properly using a mobile phone app and QR code, and then inserts the battery containing the GPS module that determines the drone's destination. One last glance at the monitor. The drone is ready to take off.

About 30 kilometres away, in the waiting room of Gikonko Health Centre, old men with walking sticks who have walked several kilometres to get here sit next to young men playing with their phones. The centre, run by the German-based Institut St. Bonifatius, was founded in 1974. After the genocide in Rwanda the surgeon and director Uta Düll rebuilt the centre, which had been completely destroyed. She sees about 200 patients per day from a catchment area of 15 kilometres: that is 15 kilometres over hills and mountainous

Zipline, a medical product delivery company based in San Francisco, California, has been operating in Rwanda since 2016. Besides the Muhanga site in Southern Province, it has had a base in Kayonza in the east of the country since 2018. Since April 2019 the drone service has also had a distribution centre in Ghana, and there are plans for sites in India and the Philippines.

The start-up's unmanned aircraft deliver blood supplies, vaccines and medicines to remote regions at speeds of 110 kilometres per hour, and have a maximum range of around 130 kilometres. The health centres send in their orders by text, the messaging service WhatsApp, or online.

The drone is launched by an electric catapult and lands by catching an arresting gear. Information from a 3D satellite map and manual ground surveys is used to calculate and programme the flight routes. According to the company, the cost of delivery via drone is comparable to conventional means by road, especially in the case of emergencies.

Zipline has been approved by the US Federal Aviation Administration for delivery of medical supplies and productive equipment in the US state of North Carolina during the COVID-19 pandemic.

terrain, meaning an arduous journey for most people here.

For the country, which lost around a million people in the genocide, leaving its past behind and finding a way to move forward has been a tour de force. "Unlike other African countries, Rwanda is a country with vision," says Uta Düll, "but not everyone can keep up with the pace." Many advances have been made, the surgeon explains, with things that are still woefully inadequate elsewhere: electricity supplies, the will to make schooling accessible to the entire population, the "mutuelle", i.e. universal health insurance. However, the vision is not being realised everywhere.

"The drone will be here in 30 minutes," says Dr Düll, glancing at her phone; Zipline has confirmed her request via WhatsApp. The arrival of the drone is a popular sight among the children who play in the health centre grounds. Today Uta Düll gives a ten-year-old boy the job of fetching the package from where it lands. At exactly the time specified there is a whirring sound above, and the little aircraft comes into view. It slows down and circles, then drops the package, which drifts down to earth on a small parachute. The boy races off, picks it up and carries it proudly on his shoulder to the centre's director.

The package that he is carrying will save the life of a new-born baby. At the health centre Dr Düll has specialised in procedures that are only performed in a few hospitals in Rwanda: for hydrocephalus, also known as water in the brain. Up to 100 of the complex operations are carried out each year at the small clinic. The doctor can only cover the 1,000-euro cost of each operation because a medical technology company from Potsdam in Germany provides her with the costly aids (called shunts) free of charge. In Rwanda up to three out of every thousand children are born with the life-threatening condition.

The chances of a child leading a largely normal life, even after a successful operation, are hard to predict. Uta Düll knows that the families themselves already suffer enormous hardship. That is inasmuch as one can talk about families at all: "Only a third of the expectant mothers who come here are married, while another third are at least in a halfway stable relationship," she says. Twenty-two-year-old Aldine is in the third group, that is, those young women who come to Gikonko alone to give birth. She cradles her baby son, whom she has named Umuhoza, meaning "comforter". In a few days, he will undergo an operation for hydrocephalus. "His chances are good," the doctor says, meaning of getting through the operation. The rest remains to be seen.

In the next bed is a young woman called Albertine, holding her first child, a little girl, in her arms. The baby has come through the procedure successfully, and the two of them can go home in a few days. There is no father to share responsibility for the child in Albertine's case either. In the foyer of the health centre blankets are spread out on the floor, with every inch occupied by mothers with babies and toddlers. There are also one or two older children, aged between four and six. Their mothers have sent them from the villages, knowing that milk is distributed at Gikonko Health Centre for the youngest children. There is bound to be some left over for the older ones, as no child is likely to be sent away hungry from the centre.

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The laboratory where the blood conserves are stored.

The package drifts down to the ground on a small parachute.

Children love fetching the newly arrived parcels.

Dr Ute Düll together with Albertine and her daughter, who she is going to operate in a few days' time.

# Community-led climate change adaptation – insights from a project beyond the norm

**In a project to strengthen resilience to climate change of a rural community in Malawi, Plan International has taken an unusual course. Instead of planning the project from beginning to end, best practices from its first phase are to serve as a basis for the second phase. And in the course of this, it has become clear that simple approaches developed together with the community can have a big impact.**

**By Kirsten Ehrich and Lena Hinzke**

In the community of Kakungu, Central Malawi, most of the 448 households live from farming and growing maize and tobacco. With heavy rains and extreme droughts taking turns in Kakungu, plants suffer leaving little for the families to harvest. In 2014, Plan International launched a development project in the community to strengthen resilience to climate change through developing sustainable livelihoods. This was to be achieved via optimised agricultural and post-harvest practices, improving nutrition practices to prevent acute malnutrition, better seeds and the provision of livestock as well as a solar-powered irrigation system.

The follow-up project has moved away from the usual course taken. While the first phase (from June 2017 to April 2019) was devoted to the implementation of the planned activities in standard fashion, the second phase, lasting until 2021, proved quite unusual. "Sharing and distribution of best practices identified during the first project phase," the project documents stated, implying that if any of the above activities from phase one turned out to have worked for Kakungu, Plan International would inform other communities, NGOs and the government to benefit them from that knowledge.

Not only did this approach mean difficulty in estimating a budget for the second phase, it also made the project team highly reliant on a high-quality mid-term evaluation to learn which of the project activities actually worked. The evaluation, carried out by a Malawi-based consultancy firm, took place between May and June 2019. For this purpose, 202 households in Kakungu and 206 households from the comparison community were surveyed. The latter shows socioeconomic, soil and weather patterns close to those in Kakungu; in addition, it was already benefiting from a government-supported project called the "Sustainable Agriculture Productivity Program" (SAPP), through which livestock and cash have been distributed, and improved crop varieties and irrigation supported. As the results show, the "contaminated" comparison community eventually turned out to be a well-suited yet ambitious benchmark (see Box).

## Participatory approach in planning and implementation

During the set-up of the project, a participatory approach inspired by the NGO-IDEAs toolbox was used (see upper Box on page 38). The community was split into groups who were asked what they wanted to achieve for their community and their own lives in the future. This yielded a set of community-owned indicators – such as the number of households owning iron sheets or cement floors, which the community regarded as a sign of increased household wealth – that found their way into the project Logical Framework. The project team also established a community monitoring committee, trained it and relied on its measuring specific community indicators, which increased community ownership.

For the second phase of the project, Plan International organised a review and planning workshop to discuss the results of the mid-term evaluation, to share results with other stakeholders and to plan the second phase on that base. The project team in Malawi invited key climate and evaluation specialists from other Plan offices, the evaluation team and the private donor family funding this project (and who would like to remain anonymous) and its preceding project. To prepare for the talk, the project team asked the community to answer the following questions: What went especially well? Whom would you like to show this? How do you want to continue and how would you keep yourself informed? The community let Plan visit several community groups and demonstrated what they had learned from the project and how they further developed the practices with their knowledge and ideas. Talking with the community mostly confirmed the findings of the mid-term evaluation and provided much more depth and reasoning why the practices were successful.

It was now clear which practices should be spread in the second phase and with whom the farmers wanted to share their knowledge: with other farmers in neighbouring villages. Here too, a participatory approach will bring to bear, directly involving farmers from Kakungu in the production of radio programmes, which will be broadcast regionally or nationwide, depending on the radio station. Kakungu itself will have "radio listener clubs" holding meetings to listen to and discuss the programmes together. Through a "lead committee", community members from Kakungu will support the establishment of new farmer field schools

### MIDTERM REVIEW – RESULTS IN A NUTSHELL

- Households in Kakungu eat more and earn more than their counterparts in the comparison community.
- Income levels are generally higher in Kakungu than in the comparison community, with Kakungu averaging at 99,182 Malawian kwacha (MK) compared to 85,220 MK in the comparison community.
- About 40 per cent of households have food security in both Kakungu and the comparison community during harvest season, though Kakungu scores significantly higher during lean seasons, with 25 per cent of the population having food security compared to 6.67 per cent in the comparison community.
- 66.7 per cent of female-headed households in Kakungu provide at least three meals a day to their children under 5 compared to 51.5 per cent of male-headed households and 47.6 per cent female-headed households in the comparison community.

Each farmer field school has 39 lead farmers who share their knowledge with their colleagues.

Photo: Alf Berg

Health and nutrition trainings are an important component of the project. Two thirds of the women in Kakungu provide at least three meals a day to their children.

Photo: Alf Berg

and organise open days in neighbouring communities to demonstrate new methods to a broad audience. Neighbouring communities will also make educational visits to Kakungu to see the practical application and learn from experiences.

## Success factors

The mid-term evaluation identified some good practices the project team could build upon in the second phase:

**Involvement of community structures:** The project progress can be highly associated with community buy-in via the cooperation with and training of government frontline staff and community structures. Frontline government workers in Kakungu are responsible for providing extension services like capacity building and advisory services to farmers and community members but often have limited resources. The project helped them bridge the gap for farmers to access extension services. In addition, pre-existing community structures like community chiefs, the Village Development Committee, the Village Natural Resources Management Committee and the Village Health Committee were also involved right from the start. Furthermore, the project introduced a Community Monitoring Committee. The community structures as well as government frontline staff were involved in the design process, the actual implementation, monitoring and review meetings. This has evidently helped build up communities' self-confidence of capacity for increasing and resilient production.

**Farmer Field Schools:** An estimated 86 per cent of the households in Kakungu were using at least one of the improved agricultural practices that the project team showcased. This is about 20 percentage points higher than the baseline's 65 per cent. Improved agricultural practices include, for example, the usage of manure, hybrid seeds, crop rotation, no-till farming and pit-farming. The mid-term evaluation showed that Kakungu farmers' increased adoption of improved agricultural technologies could strongly be associated with the Farmer Field School approach. The project established two farmer field schools with demonstration plots and 39 lead farmers per farmer field school. The lead farmers were trained in improved agricultural practices and have transmitted their knowledge with the help of the demonstration plots to 173 other farmers (108 women and 65 men) so far. The three different demonstration plots, one with conventional chemical fertiliser, one with blended organic manure and one plot with no fertiliser at all, were located on a road frequently used by farmers. Thus farmers regularly witnessed how the plants and soil were developing. The uptake of the improved agricultural practices was lagged, taking just as long as the plants from the blended organic manure demonstration plot did to carry yield – as good as the chemically fertilised and much better than the unfertilised plants.

**Blended organic manure making and utilisation:** Blended organic manure provides an alternative source of fertiliser for increased yields that is cheaper than chemical fertiliser. The Malawian government department of agriculture has begun introducing blended manure in other communities. However, in Kakungu, blended organic manure making was started by the project in collaboration with the Agricultural Extension Development Officer. While so far practised by only about 11 per cent of the households, qualitative data revealed a profound and growing community appreciation of manure making. Since manure and other ingredients are available in the community, the farmers can easily produce blended manure themselves, with no additional cost. Some households were given livestock such as pigs, goats and chicken. When the animals reproduced, their young were passed on to other families in order to provide more households with livestock and its benefits, like fresh milk, eggs and meat, but also dung which can be turned into blended organic manure via adding ash, plant remains, yeast, water and some other locally available ingredients.

**Village Savings and Loans Associations:** Before the start of the project, five Village Savings and Loans Associations (VSLAs) existed in Kakungu. In coordination with the community they have been increased to 28, with 181 active members, 41 of them men and 140 women, in midline. The mid-term evaluation found the VSLAs to have contributed to the heightened income security in Kakungu, hence building resilience among many farming households, importantly so among women. Average loan amounts have constantly been on the rise, with women borrowing almost twice the amount of men. The VSLAs benefited from the project via a five-day training on business management and income-generating

## NGO IDEAS

NGO IDEAs stands for "NGO Impact on Development, Empowerment and Actions". The concept was first implemented in 2004 and optimised in the following years. It provides several tools to enable and improve participatory monitoring of outcome and impact of development projects. Self-assessment and goal-setting by the beneficiaries themselves are key aspects of the concept and tools.

More information: www.ngo-ideas.net

activities and follow-up of the trainings during monitoring sessions aimed at diversifying member income. The members were trained to improve household incomes negatively affected through reduced crop productivity as a result of climate change. While improved agricultural practices, better seeds and the introduction of backyard gardens helped generate better and more diverse yields, the VSLAs improved members' negotiating skills and financial literacy. In addition, contract farming negotiated by the project together with the farmers ensured guaranteed purchase of the agricultural produce by buyers. As VSLAs are led and managed by community members themselves, prospects for sustainability are good.

### Some lessons learnt

Based on insights from the mid-term review, some measures were adjusted. One of them concerned the tree-planting intervention, the only measure not entirely developed together with the community but suggested by Plan International and the private donor family to effectively prevent erosion. The mid-term evaluation revealed that fewer high growing trees were planted than planned, and in some cases, these trees did not survive. People planted the trees on private property, and the community woodlot originally designated for big trees was only scarcely vegetated with a fast-growing type of tree resembling a bush and providing much-needed firewood for cooking. In the review and planning workshop, the team decided to adjust the tree-planting activity to also use long-lasting indigenous trees and fruit trees, fruits being an incentive for people to wait for trees to be fully grown. The choice for fruit-growing trees was complemented by an attempt at building energy-saving stoves that require far less firewood than conventional fireplaces. The climate specialist shared a clay recipe used by Plan Zambia for building more heat-resistant while heat-insulating ovens, which the team could share with the community in Kakungu.

Plan gave these two and some more recommendations for improvement back to the community to vote using Participatory Rural Appraisal (PRA) methods (in this case: do a ranking with the community while avoiding writing to include illiterate community members) on which ones they find most important to improve the organisation's intervention in Kakungu. The other part of the budget will be used to spread the best practices and lessons learnt with others.

### No need for high-tech solutions

To conclude, the project team can highly recommend using the first phase of a project to gather best practices and the second phase to implement them together with the most experienced experts: the target group. It would appear that there is not always a need for high-tech, innovative approaches, since simple, reliable and low-risk ones can be easily adjusted to fit climate change adaptation and prove just as effective if they are well-embedded in the community. For example, seeds for drought-resistant crops and the solar-powered irrigation system made sure crops would grow even during dry spells. Trainings on improved agricultural practices in the context of climate change also helped boost yield in the climate-affected areas of income generation while contract farming made sure buyer firms would purchase the yield. Nutrition trainings were complemented by trainings on how to start a backyard garden and by the provision of livestock for improved availability of protein-rich food and vitamin-rich vegetables, and were combined with trainings on how to preserve and process food to be better able to store it while being able to achieve higher prices when selling surplus on the market. The VSLAs' trainings were tailored to include income-generating activities diversifying income in areas not so affected by climate change.

What has also been revealed is the need for project teams to not only consist of technicians but also and especially community facilitators who have experience in participatory project planning and management, the skill to identify and combine local best practices with state-of-the-art knowledge and the ability to mediate between both.

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References: **www.rural21.com**

## COMPLEMENTING INTERVENTIONS FOR CLIMATE CHANGE ADAPTATION

The agriculture, nutrition and income interventions were all developed together with the community and all complement each other, hence closing potential gaps that could be created if a single intervention were implemented. Measures consisted of:

- access to seeds for drought-resistant plants (e.g. sweet potato and cassava);
- foundation of a seedbank and introduction to seed multiplication and a seed pass-on scheme;
- trainings on sustainable agriculture and land management (e.g. no-till farming and using blended organic manure) via the farmer field school approach;
- trainings on post-harvest techniques;
- VSLAs' trainings on savings, income-generating measures and business management;
- introduction of contract farming on high value crops;
- provision and production of livestock and the establishment of a pass-on scheme;
- introduction of Community Animal Health Workers;
- trainings on backyard gardening;
- food processing and preservation;
- health and nutrition trainings;
- trainings on how to build energy-saving stoves with local material;
- provision of solar-powered irrigation;
- tree-planting.

Some of these measures started during the preceding project from 2014 to 2017 and are being continued during this follow-up project.

# The myth of Africa's ageing farmers

**Africa's farming population is widely held to be ageing. However, our authors present statistics suggesting that maintaining a sufficiently dynamic and youthful workforce in farming is not among the many agricultural challenges that the sub-Saharan region faces.**

**By F. Kwame Yeboah and T. S. Jayne**

Among all regions of the world, sub-Saharan Africa has registered the highest rate of agricultural production growth since 2000. Because of agriculture's strong forward and backward linkages with the rest of the economies, agricultural growth has contributed to Africa's rapid expansion of off-farm employment. Indeed, African countries achieving the highest rates of agricultural productivity growth over the past decade generally experienced the fastest growth in off-farm employment and non-farm labour productivity (Yeboah and Jayne, 2018). These patterns, which mirror East Asia's transformation experience, suggest the performance of agriculture will influence the pace of economic development and diversification in Africa too. However, it is widely believed that Africa's agricultural-led growth trajectory could be jeopardised by an ageing farm population arising from youth disinterest in agriculture (Jöhr, 2012; BBC, 2019). These concerns are succinctly expressed by the Food and Agriculture Organization:

*The average age of farmers in the United States and other developed countries borders on 60. In Africa, the average age of farmers is also about 60, despite the fact that 60 per cent of Africa's population is under 24 years of age. So, as farmers are getting older – and as many of them are women with less access to productive resources, especially in developing countries – this raises questions about future prospects for increasing farm productivity. Rural youth are looking for a better livelihood in the cities. Can this pattern fit a sustainable future?* (FAO 2014, p. 2)

Many young Africans continue to work in agriculture – although often on a part-time basis.

Photo: Stephan Bachenheimer

Despite much conjecture about an ageing farming population, and resulting efforts to encourage greater youth engagement in agriculture, we are unaware of any empirical evidence to support these claims in sub-Saharan Africa. For a region with an average age of 19 years and where, according to the International Labour Organization, more than half of the labour force is engaged in agriculture, it seems implausible for the mean age of the farming population to be around 60 years. However, it is important to examine this issue empirically as we would agree that urgent attention would be required if Africa's youth were streaming out of farming so rapidly as to dramatically raise the age of the region's farming population. We therefore utilised available nationally representative survey data from six African countries to examine trends in the age distribution of the labour force in farm and off-farm employment since 2000.

For each country, we examine the trends in average age of the workforce in farming and the off-farm sector, disaggregated by gender and intensity of engagement, as measured by individual's stated primary source of employment and the relative share of their total work time devoted to employment in the sector. Because many Africans in the labour force have more than one job in a given year, we also compute full-time equivalents (FTEs; see Box on page 40) for each individual contained in these nationally representative surveys and report the mean ages according to their shares of time in farming and off-farm activities. We test the robustness of our findings by replicating the analysis for different age distributions, e.g. including vs. excluding youth in the 15–24-year-old category (because their employment patterns often reflect the dictates of their parents rather than long-term employment aspirations) and extending the workforce beyond the standard upper bound of 64 years of age.

## Most African adults in farming below 40 years of age

The average age of working-aged individuals primarily engaged in farming ranges from about 32 to 39 years – far less than the widely reported 60 years. Trends over the past decade in the mean age of working-aged adults has in most countries either increased by one or two years or remained constant. These findings are reported in the upper Table on page 41, based on all individuals between 15–64 years of age, and in the lower Table, which restricts the analysis to all individuals aged 25 years to 64 years.

### Background

The sources used were the Living Standards Measurement Study – Integrated Surveys of Agriculture (LSMS-ISA) for Nigeria, Tanzania, Rwanda, Uganda, and Labor Force Surveys for Ghana and Zambia. These surveys are conducted by the national statistical services in each country with support from the World Bank. Country selection was based on regional representation across sub-Saharan Africa and the availability of comparable data over two or more periods separated by at least three years. These six countries in the analysis constitute about 34 per cent of the total population of sub-Saharan Africa.

The full-time equivalent (FTE) estimates the share of individuals' work time over the survey period devoted to a particular job. A FTE of 40 hours a week, 4 weeks per month for a 12-month year period was assumed as one FTE. The FTE of any one job is thus computed as the actual number of hours worked as a share of this benchmark 1,920-hour work year.

To provide some illustrations, the most recently available surveys reveal that the mean age of working-age individuals (15–64 years) engaged primarily in farming was 32 years in Tanzania and 39 years in Nigeria. Among individuals devoting at least 50 per cent of their total work time to farming, the mean ages are slightly higher, ranging from 33 years to 40 years (see upper Table). Although farming is generally the primary employment for young people, it is often a part-time activity as youth typically combine employment with education. Hence, restricting the sample to those devoting at least 50 per cent FTE to farming slightly raises the average age of those in farming. Similarly, when excluding the 15–24 year old youth population entirely, the mean age of farmers ranges from 39 years in Zambia to 45 years in Nigeria (lower Table). There are very slight differences in the mean ages of men and women in farming.

These results hold even if the upper limit of the labour force is extended to include all individuals over 64 years of age. Doing so increases the average age of the farming workforce only by 1–2 years because this group constitutes a mere 3.1 per cent of sub-Saharan Africa's overall population (United Nations, 2019).

## The age of Africans in farming is hardly rising

Moreover, the age structure of farmers has hardly changed over the past decade or so. Between the first and latest survey periods, which spanned from 6 to 12 years, the average age of the labour force (people between 15 and 64 years of age) in farming increased by less than 2 years in four of the six study countries (Ghana, Rwanda, Uganda, Zambia). Mean farmer age remained unchanged in Nigeria and declined slightly in Tanzania. A similar picture holds when the sample is restricted to individuals over 24 years who spend at least half of their labour time in farming (lower Table). Here, several countries recorded no change in mean age and none of them experienced more than a 2-year rise in mean age. Although a large number of rural youth are leaving farming as off-farm opportunities continue to expand, the majority of the economically active youth population remains engaged in farming at least on a part-time basis (Yeboah and Jayne, 2018), so that the average age of African adults in farming is hardly rising over time.

## People in off-farm jobs slightly younger than those in farming

Individuals in off-farm jobs are generally a couple of years younger than those in farming. As shown in the Tables, working-age individuals devoting at least 50 per cent of their total work time to farming are from one to at most four years older on average than their counterparts in the off-farm sector. But even here the story must be nuanced. For the entire working-age population, the mean age of farmers exceeds that of off-farm workers in only two of the six countries (Ghana and Rwanda). They are roughly the same in three other countries (Nigeria, Uganda, and Zambia). In Tanzania, the mean age of farmers is actually lower than of those in off-farm employment. When excluding the 15–24 year group from the analysis, the farming population is generally older than those engaged in off-farm employment by two years on average. Differences in the mean age of workers in off-farm and farm jobs is expected considering the rapid expansion of off-farm employment opportunities in Africa over the past decade (Yeboah and Jayne, 2018; OECD, 2018). With their relatively higher educational attainment levels and mobility, African youth are taking advantage of job opportunities in the off-farm sector, which further depresses the average age in the off-farm sector relative to farming but in no way implies that few young people are remaining in farming or that the age of African farmers is dramatically rising.

## Conclusions

It has become conventional wisdom that African youth's disinterest in farming has induced a large-scale exit of young people from African agriculture, leaving behind an ageing farm population poorly equipped to sustain the region's food needs. However, nationally representative household survey data from every one of the six African countries in which two or more Living Standards Monitoring Surveys with Integrated Agricultural Surveys were conducted show a decidedly more optimistic picture. We highlight three main conclusions. First, contrary to widespread perceptions that most African farmers are elderly, the average age of the agricultural workforce ranges from about 32 years to 39 years. Even when not counting young adults in the 15–24 year old range, the average age of the agricultural workforce is 38–45 years. And even including all elderly people of any age working in farming hardly changes the average age. This is because only 3.1 per cent of sub-Saharan Africa's population are 65 years and over, and only about half of them are economically active and engaged in farming.

Second, the average age of the agricultural workforce in the six African countries examined has either increased by one or two years or remained constant in most of them over the past decade. Considering that roughly 7 to 10 million young people are entering the labour force in sub-Saharan Africa each year, it is easy to understand why the average age of the farming population is not rising, even with large numbers of young people partially or fully moving out of farming. It may be at least several decades before Africa's demographic conditions begin to show increases in the mean age of the overall labour force.

Third, individuals in off-farm jobs are an average one to three years younger than those in farming, especially when the sample excludes the 15–24-year-old age group.

As highlighted in previous studies, farming's employment shares are declining over time as opportunities for off-farm employment expand in Africa's rapidly transforming economies. However, farming still accounts for a significant proportion of the jobs held by working-age individuals and remains the single largest employer of rural youth, although most of these jobs are part-time (Yeboah and Jayne, 2018). While the proportion of young Africans entering farming is certainly lower today than it was several decades ago, a large youth population remains in farming, putting

## Mean age of working age individuals (15–64 years), by extent of engagement in farming

| Country | Survey years | whose primary employment is non-farm activities | | | engaged at least 50% FTE in non-farm activities | | | engaged at least 50% FTE in farming | | | whose primary activity is farming | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Males | Females | Total | Males | Females | Total | Males | Females | Total | Males | Females |
| **Ghana** | 2005/06 | 36 | 36 | 35 | 37 | 37 | 36 | 38 | 38 | 38 | 37 | 36 | 37 |
| | 2012/13 | 35 | 35 | 35 | 36 | 36 | 36 | 39 | 39 | 38 | 35 | 34 | 36 |
| | 2016/17 | 36 | 36 | 35 | 37 | 37 | 37 | 39 | 39 | 40 | 37 | 36 | 38 |
| **Nigeria** | 2003/04 | 39 | 40 | 38 | 39 | 38 | 40 | 40 | 40 | 40 | 39 | 40 | 39 |
| | 2012/13 | 39 | 40 | 38 | 39 | 40 | 39 | 39 | 39 | 39 | 37 | 36 | 38 |
| | 2015/16 | 40 | 40 | 39 | 40 | 41 | 39 | 40 | 39 | 41 | 39 | 38 | 40 |
| **Rwanda** | 2005/06 | 32 | 32 | 33 | 33 | 32 | 33 | 33 | 33 | 34 | 33 | 33 | 33 |
| | 2010/11 | 31 | 31 | 32 | 32 | 32 | 33 | 36 | 35 | 36 | 35 | 34 | 35 |
| | 2013/14 | 31 | 32 | 30 | 33 | 33 | 32 | 37 | 37 | 37 | 35 | 34 | 35 |
| **Tanzania** | 2008/09 | 35 | 36 | 35 | 36 | 36 | 36 | 36 | 35 | 36 | 35 | 35 | 35 |
| | 2012/13 | 33 | 34 | 33 | 34 | 35 | 34 | 35 | 34 | 35 | 33 | 32 | 34 |
| | 2014/15 | 35 | 35 | 34 | 35 | 36 | 34 | 33 | 32 | 34 | 32 | 32 | 33 |
| **Uganda** | 2005/06 | 33 | 33 | 31 | 33 | 33 | 32 | 33 | 33 | 33 | 31 | 31 | 32 |
| | 2011/12 | 32 | 33 | 32 | 33 | 32 | 33 | 34 | 33 | 35 | 31 | 30 | 32 |
| | 2013/14 | 34 | 35 | 34 | 36 | 36 | 34 | 36 | 35 | 36 | 33 | 31 | 33 |
| **Zambia** | 2005 | 33 | 34 | 32 | 33 | 34 | 32 | 31 | 31 | 32 | 31 | 31 | 32 |
| | 2012 | 34 | 34 | 33 | 34 | 35 | 34 | 34 | 35 | 33 | 33 | 34 | 33 |

## Mean age of individuals in the labour force at least 25 years of age, by extent of engagement in farming

| Country | Survey years | whose primary employment is non-farm activities | | | engaged at least 50% FTE in non-farm activities | | | engaged at least 50% FTE in farming | | | whose primary activity is farming | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Males | Females | Total | Males | Females | Total | Males | Females | Total | Males | Females |
| **Ghana** | 2005/06 | 39 | 39 | 39 | 39 | 39 | 39 | 41 | 42 | 41 | 41 | 41 | 41 |
| | 2012/13 | 39 | 38 | 39 | 39 | 39 | 39 | 42 | 43 | 42 | 42 | 43 | 42 |
| | 2016/17 | 39 | 39 | 39 | 40 | 39 | 40 | 43 | 44 | 43 | 43 | 43 | 43 |
| **Nigeria** | 2003/04 | 41 | 42 | 40 | 40 | 41 | 39 | 43 | 43 | 42 | 43 | 43 | 42 |
| | 2012/13 | 41 | 42 | 41 | 42 | 42 | 41 | 44 | 44 | 43 | 43 | 44 | 43 |
| | 2015/16 | 42 | 43 | 41 | 42 | 43 | 41 | 45 | 45 | 44 | 45 | 45 | 44 |
| **Rwanda** | 2005/06 | 37 | 37 | 38 | 37 | 36 | 37 | 40 | 40 | 40 | 40 | 39 | 40 |
| | 2010/11 | 36 | 36 | 36 | 36 | 35 | 36 | 40 | 40 | 40 | 40 | 40 | 40 |
| | 2013/14 | 36 | 36 | 35 | 36 | 36 | 37 | 41 | 41 | 40 | 40 | 41 | 40 |
| **Tanzania** | 2008/09 | 38 | 38 | 38 | 39 | 39 | 39 | 40 | 41 | 40 | 40 | 40 | 40 |
| | 2012/13 | 38 | 38 | 38 | 38 | 39 | 38 | 41 | 41 | 41 | 41 | 41 | 41 |
| | 2014/15 | 38 | 39 | 38 | 38 | 38 | 38 | 41 | 41 | 40 | 40 | 41 | 40 |
| **Uganda** | 2005/06 | 36 | 37 | 35 | 36 | 37 | 35 | 39 | 39 | 38 | 39 | 39 | 39 |
| | 2011/12 | 36 | 37 | 36 | 37 | 37 | 37 | 40 | 39 | 40 | 40 | 40 | 40 |
| | 2013/14 | 39 | 39 | 38 | 39 | 39 | 38 | 41 | 41 | 41 | 41 | 41 | 41 |
| **Zambia** | 2005 | 36 | 36 | 36 | 36 | 36 | 36 | 39 | 38 | 39 | 39 | 38 | 39 |
| | 2012 | 37 | 37 | 37 | 37 | 37 | 37 | 39 | 39 | 39 | 39 | 39 | 39 |

Source: Author's estimates from Ghana Living Standard Survey 5, 6 and 7; Nigeria's Living Standard Survey (2004) and General Household Survey (2013 and 2016); Rwanda Integrated Household Living Survey (EICV 2, 3 and 4); Tanzania National Panel Survey (2009, 2013 and 2015); Uganda National Panel Survey (2006, 2012 and 2014); Zambia Labor Force Surveys (2005 and 2012).

downward pressure on the average age of the farming population.

Given these nationally representative surveys, it should be clear that maintaining a sufficiently dynamic and youthful workforce in farming is fortunately not among the region's many agricultural challenges. What is missing, however, is a critical mass of skilled young Africans with access to finance and knowhow to drive productivity growth in farming and related value chains. The idea of keeping young people in farming for fear of African agriculture becoming the preserve of the elderly is misplaced. A more effective strategy would prioritise resourcing the millions of rural youth already engaged in farming to make farming more profitable. Making agriculture "sexy" is not nearly as important as making it profitable. Young people will flock to agriculture if/when it becomes clear that it can make good money. A related priority is for governments to address the many policy, regulatory and financing barriers that inhibit skilled young Africans from starting and expanding agribusiness firms that provide important services to African farmers.

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# The potential of agroecology to build climate-resilient livelihoods and food systems

**With the severe impacts that climate change is having on food security and nutrition, there is an urgent call for more sustainable and climate-resilient food systems. The quest for sustainable solutions is gaining increased importance as the world is tackling the COVID-19 pandemic and wants to "build back better". A recent scientific study shows that agroecology could play a vital role here.**

**By Maryline Darmaun, Fabio Leippert, Martial Bernoux, Molefi Mpheshea and Adrian Müller**

Agroecology builds on key management characteristics which strengthen climate resilience (see Figure). To begin with, it is based on ecological principles, with a strong focus on high levels of biodiversity, overall diversity and heterogeneity (integrating different breeds, varieties and species into agricultural production), and healthy soils. It also takes into account social aspects, in particular the co-creation and sharing of knowledge and the promotion of local and traditional knowledge.

Economic aspects are considered as well, e.g. through diversification of economic activities (diversification of varieties and species grown/raised on the farm, integrated systems), which mitigates the risk of single-crop yield losses. Mitigation co-benefits are also achieved, mainly related to increased soil organic carbon (carbon sequestration) and reduced synthetic fertiliser use through otherwise improved soil fertility. And last but not least, institutional aspects, such as knowledge co-creation and dissemination via advisory services and farmer-to-farmer approaches have a key role to play in supporting the development, improvement and uptake of agroecology.

Knowledge sharing is key in agroecology. Photo: Bioversity International/A. Gupta

## Evidence of agroecology's potential to increase climate resilience

A broad-based study examined the potential of agroecology to build climate-resilient livelihoods and food systems (see Box). It revealed that agroecology not only can foster climate change adaptation and increase resilience but also contribute to a low-emission pathway. The results of this study support the claim that agroecology should be acknowledged as a powerful approach to transform agricultural production systems for a more sustainable and climate-resilient future.

Agroecology is gaining momentum in the international policy arena, in particular in the United Nations Framework Convention on Climate Change (UNFCCC) and its Koronivia Joint Work on Agriculture (KJWA). Furthermore, an increasing number of countries and stakeholders from different backgrounds see agroecology and related approaches as a means well-suited to attain adaptation and mitigation targets and to achieve effective transformational change in agricultural sectors. For instance, an analysis of 136 countries' nationally determined contributions (NDCs) demonstrates that ten per cent of them refer to agroecology as a promising approach to address climate change. Isolated agroecological approaches are also mentioned in NDCs, mainly related to the core agroecological principles according to FAO, namely "efficiency", "recycling", "diversity" and "co-creating of knowledge". These are often associated with alternative conceptions of production systems such as conservation agriculture, climate-smart agriculture, etc.

## Lessons learned from Kenya and Senegal

To gain a better understanding of the ecological and socio-economic resilience performance of agroecology according to the 13 indicators of agroecosystems resilience of Cabell and Oelofse (2012), and mobilising the FAO SHARP tool (Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists), comparative field studies were conducted in Kenya and Senegal. Overall results show that agroecological farmers have significantly higher resilience levels than the control group (non-agroecological). In both countries and despite very different contexts, spatial and temporal heterogeneity as well as integration and sharing of traditional knowledge appear to be factors that enhance resilience of these systems.

This study reveals that:

- **Agroecology enhances social and human capital.** The ability of agroecological farmers to self-organise allows them to form broader social safety networks that buffer them against disturbances including both climatic and economic impacts. The rich traditional knowledge and wider management skills passed down through generations within agroecological farms also contribute to their adap-

tive capacity. Agroecological farmers appear not to be reactive to climatic and other shocks but are able to anticipate and plan their adaptation processes in accordance with the past and current events. This is made possible by a plethora of different learning and information-sharing mechanisms that seem to be more widespread among agroecology farms compared to their conventional counterparts.

- **Diversification within agroecological farms builds their natural capital.** Higher levels of biological diversity in these farms improve biogeochemical processes like nutrient and water cycling and increase soil organic matter levels that add to soil fertility and overall soil health. These processes are fundamental for resilience building and adaptation to climate change. Furthermore, diversification of different aspects of food systems is a crucial element in enhancing performance and efficiency that could manifest into increased resilience, reduced risks and maintained stability of food production in the wake of shocks and stresses.

## A window of opportunity

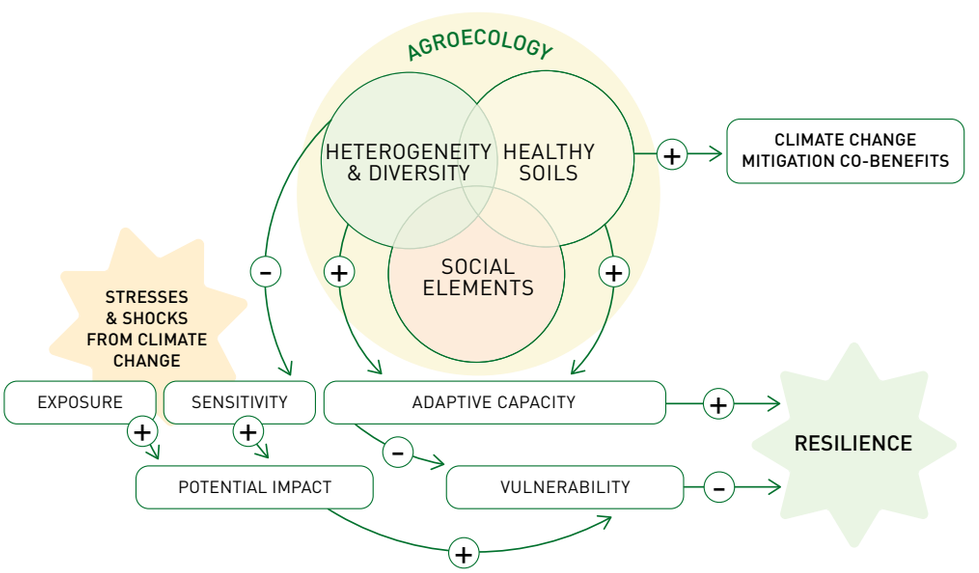
The case studies from Kenya and Senegal show that in both countries, despite different policy settings, there is considerable potential for agroecology to gain recognition as a resilient and sustainable production approach. However, it is challenging to translate the interdisciplinary and systemic nature of agroecology into policies, laws and strategies. Both case studies highlight the importance of training and awareness-raising activities to create a common and systemic understanding of agroecology and to ensure that it is embraced by appropriate institutional frameworks.

Based on the study, the following series of recommendations are drawn, targeted to donors, decision-makers and researchers:

- Given the existing evidence, agroecology should be acknowledged as a powerful approach to transform agricultural production systems for a more sustainable and climate-resilient future.
- Existing financial flows to agriculture should be better channelled according to agroecological aspects.
- Complexity ought to be embraced, and a more systemic understanding of challenges and solutions to hedge against climate change has to be gained by breaking silos and working across agricultural sectors.
- Investment in research on agroecological approaches must be stepped up, and transdisciplinary and participatory action research, conducted by innovation platforms that foster co-creation and dissemination of knowledge, requires support.
- Further comparative research on the multidimensional impacts of agroecology has to be developed for rational decision-making and efficient resource allocation at all levels.
- There are no "one-size fits all" solutions, no silver bullets – individual contexts and local knowledge building on the ten elements of agroecology must be considered.

A profound holistic and systemic transformation is needed to address climate change as well as to achieve Agenda 2030 and the four dimensions of food security (availability, access, utilisation and stability). These challenges will have to be faced in the light of a growing global population which is putting increased pressure on natural resources and impacting land, water and biodiversity.

### The climate resilience concept and main agroecological resilience strengthening mechanisms




### The study at a glance

The study *The potential of agroecology to build climate-resilient livelihoods and food systems* was jointly developed by a broad set of actors: the Food and Agriculture Organization of the United Nations (FAO), research institutions (FIBL, Bioversity, Institut Sénégalais de Recherches Agricoles – ISRA) and civil society organisations (Biovision Foundation for ecological development, Enda Pronat, Institute for Culture and Ecology – ICE). It addresses three different dimensions:

1) an analysis of the International policy arena, in particular regarding the United Nations Framework Convention on Climate Change (UNFCCC) and nationally determined contributions (NDCs) and the Koronivia Joint Work on Agriculture (KJWA); 2) a meta-analysis of peer-reviewed scientific studies on agroecology and climate change; 3) two country case studies that assess both the policy potential of agroecology in national settings and the technical potential of agroecology to foster climate resilience at farm level.

**For more information, visit the FAO website or the Biovision website.**

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