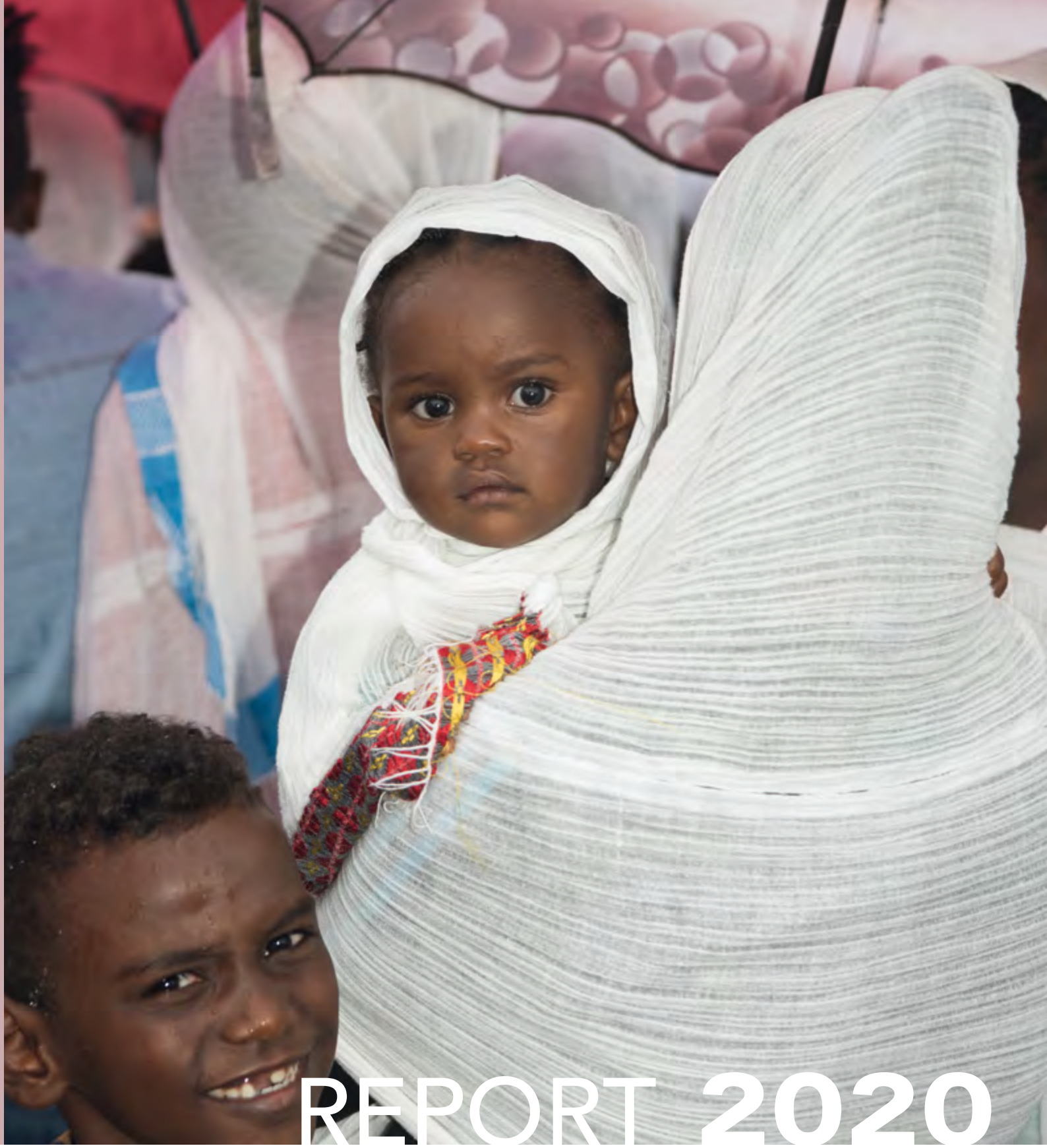

REPORT 2020

Nestlé Foundation

for the study of problems of nutrition in the world


"Live as if you were to die
tomorrow. Learn as if you were
to live forever."
Mahatma Gandhi

FOCUSED AND GLOBAL – THE FOUNDATION FOR THE STUDY OF THE PROBLEMS OF NUTRITION IN THE WORLD

HUMAN RIGHTS – BASED FOCUS AND PRACTICE

RESEARCH – HIGH-IMPACT RESEARCH FOR DEVELOPMENT

INNOVATION – FOR SUCCESS

LOCAL CAPACITY BUILDING – AS A BASIS FOR IMPROVEMENT

SUSTAINABILITY – A KEY MISSION

ENDURABLE NUTRITION – THE PRESCRIPTION FOR SUCCESS

PUBLIC HEALTH – ORIENTED

THE FOUNDATION AT A GLANCE

EVIDENCE-BASED – PROACTIVITY

PARTNERSHIP – FOR LONG-TERM SUCCESS

SOLUTION – ORIENTED ACTION RESEARCH

enLINK - ing FOR A BETTER WORLD


CAPACITY BUILDING


enLINK-ing FOR A BETTER WORLD


PUBLIC HEALTH ORIENTED

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PRESIDENT'S MESSAGE

Last year's president's address was written just at the outbreak of the corona pandemic, which at the time still seemed of minor importance compared to the mortality caused by insufficient and poor nutrition in the world. Now, twelve months later, we know that 2.5 million people have lost their life to the pandemic. It has spread widely, and even though populations with high-sugar diets and the resulting obesity and diabetes seem to be most vulnerable to corona, the pandemic has also affected the developing world and will affect it even more through the secondary effects of a global economic downturn, with an expected reduction of GDP of 4.5%; already USD 13 trillion is missing.

Worldwide trade and travel have been affected and support chains have been interrupted, all factors that will impact the nutrition and health of the weakest members of our world population. Food prices and available incomes govern household decisions on food and dietary intake and with prices going up for fruits, vegetables, dairy products and protein-rich food, food insecurity and malnutrition will increase rather than reaching the goal of decreasing nutritional inequalities and achieving zero hunger. The Nestlé Foundation over the years has worked on providing new knowledge in developing countries to address food insecurity through the local provision of measures to advance food security and good nutrition. By empowering local scientists, advances have been made in agro-ecology, in the development of locally grown high-nutrient-content staple food and alternative foods such as high-protein insects and termites, but also in improving nutrition education to support the optimal nutrition of mother-infant dyads and breastfeeding. With a sustainable approach to balanced nutrition from local products the future generation will survive future pandemics and the Nestlé Foundation will continue to provide opportunities for local researchers to prove their concepts for sustainable nutrition and food security.

Petra S. Hüppi
President

One of the Foundation's main aims is the transfer of scientific and technological knowlege to low-income countries.

The Foundation advances nutritional science both by supporting nutrition research projects in established institutes and universities and by giving focused support to existing nutrition schools and educational programs. The promotion of local capacity for independent, implementable research is a central aspect of our activities.

To further fulfil the mandate of the Council and also encourage sustainable improvement in nutrition, a proactive, strategic area of activities was introduced in 2004: the enLINK Initiative. This encompasses a set of interrelated efforts:

PROJECTS INITIATED BY THE FOUNDATION

THE enLINK INITIATIVE

- Promoting local capacity for nutrition research
  - Anchoring of research capacity and innovation
  - Promoting local generation of research ideas
  - Promoting local ownership and empowerment
  - Discouraging purely donor- or sponsor-driven research
  - Promoting critical-evidence-based thinking and research
  - From idea to implementation: Assistance from the germ of a research idea and project through its sustainable implementation
- Strengthening expertise and know-how
  - Promoting access to information
  - The enLink library
  - Promoting local knowledge exchange and generation
  - Needs-based, targeted assistance
  - Network-system capacity building
  - Promoting and furthering of researchers' stamina
- Nestlé Foundation Research for Development (NFR4D) program

THE enLINK INITIATIVE

Sustainability and public-health relevance have been and will remain key aspects for all activities of the Foundation. Research projects need to result in short- and long-term public-health implementation. Knowledge and know-how have to be sustainable at all levels of the population, meaning that the knowledge has to be implemented and become part of daily life. Knowledge has to trickle down to the population.

The vast experience of the Foundation's Council members as well as the Foundation's past activities led to the creation of the enLINK Initiative in 2004, an initiative which illustrates the proactivity of the Foundation regarding its core issues.

This initiative focuses on information transfer in the area of nutrition and malnutrition as well as on the resolution of specific research questions and their implementation at the public-health level. The core competence and activity of the Foundation is the support of nutrition research in low-income countries. The enLINK initiative is an add-on to our key activities to improve the research capacity.

The name enLINK comes from the old English verb "to enlink", meaning "to chain together" or "to connect, as by links". The analysis of the semantic relations of "enlink" reveals related words which illustrate our central concepts and aims: to connect, to join, to associate, to unite, to tie, to conjoin.

Our mission is to link and join cultures; to associate and conjoin institutions and people locally to study and diminish the problems of malnutrition globally.

Malnutrition can only be solved by "enlinking" – connecting – different strategies and approaches. Malnutrition has to be addressed universally by joint strategies which address many levels, looking at the level of medical issues (such as infection) and hygiene (such as water quality), proposing changes at the level of agriculture as well as in the society at large, and, last but not least, working to improve the level of education and information.

The enLINK Initiative has five main levels:

1. exploration in nutrition – building practical research capacity: This is the main purpose and aim of the Foundation.
2. education in nutrition: This level of the enLINK initiative also implies the creation of research-based evidence and subsequent transfer of the knowledge to the population.
3. the enLINK library: At present, after having shipped 217 library trunks to 34 countries, only digital content is provided (free of charge) in the enLINK digital library (www.enlink.org).
4. endurable nutrition: All activities should be implemented and sustainable.
5. Nestlé Foundation R4D initiative – research for development (NF-R4D): Sustainable, targeted, concerted support of young researchers and their institutions.

The digital enLINK library is currently offering free full-text access to a few nutrition journals and more than 30 e-books – many of them indispensable classic textbooks – in the newest editions available. This digital library is accessible free of charge to registered users who all receive a personal password; registration is also free as long as the applicant comes from a low-income country. The library is continuously updated

and adapted to specific needs and in response to user feedback. Evidence and content which end up in textbooks are usually more practice-related than the research knowledge from latest findings, which is published in research journals. Therefore the weight of the library lies more in the e-textbook section to assure a good basic knowledge transfer as well as knowledge accessibility. A solid knowledge of the physiology and pathophysiology of nutritional sciences is the cornerstone for the development of nutrition research focused on basic needs and designed to drive concrete improvements.

The approach of the Foundation in the enLINK initiative reflects the need for multidimensionality to solve the problems of under- and malnutrition. Knowledge and know-how are the basis and beginning of every and any improvement.

THE enLINK CIRCLE

COVID-19: THE LATEST WAKE-UP CALL FOR HUMAN RIGHTS

From United Nations statements, politicians, TV and radio networks, newspapers and medical journals to many personal comments—all have referred to the Covid-19 pandemic as a global wake-up call, similar to earlier SARS-Cov outbreaks (1). Indeed the present situation is for most of us a wake-up call, revealing the unimaginable vulnerability of the modern world and society. Covid-19 catapulted us out of our somnambulic lifestyle of unlimited consumption and a purely growth- and profit-oriented economic system (2,3).

According to the Cambridge dictionary a "wake-up call" is defined as "something that happens [that] make[s] you realize that you need to take action to change a situation". Indeed, for many Covid-19 was a wake-up call initiating a strategic review of our personal way of life, but also of the structures and components of our society, the rural/urban divide, the global order, our health care system, our educational system, our economic and trade system, climate change, personal values and last but not least also our food system (see the vision contribution on page 34). There is not one single aspect of life which has remained unaffected by Covid-19. Despite the huge toll paid in the form of so many deaths, it is the order of the day to use this sad opportunity to search for a solution as well as engage in a strategic review to improve livelihoods for all and to avoid future deaths and emerging pandemics (4).

The reaction of the global medical research community to elucidate the characteristics of the virus as well the immense efforts to produce a vaccine is more than impressive and unprecedented in the whole history of humankind. As of the end of 2020, the first vaccinations are already ongoing and it can be hoped that the medical developments as well as public health knowledge will translate into a timely resolution of the pandemic. Nevertheless, we know that the modern world is getting more and more complex and often solutions lead to the next problem and we all know that the vaccination alone is most likely not enough to prevent future pandemics (5).

The Covid-19 epidemiology and the world's reaction illustrate the concept of universal risk, and yet at the same time it uncovered the crucial role of all forms of inequality (6,7). The incredible speed in developing the vaccine is not only impressive, but also shows that "where there is a will, there is a way". The universality of the Covid-19 risk for infection independent of socioeconomic status and geography were most likely the key drivers for a fast vaccine solution (7). Some critical minds even whispered that unfortunately the lack of universal health care, clean water and hygiene, or malnutrition—just to mention a few crises—does not affect the "right" people for immediate universal proactivity to solve the issue in a sustainable and successful manner (8-11). A thought worthwhile to keep in mind for the future. As we know from most other diseases, including non-communicable diseases, poor people are affected more often by the virus and the death toll is also disproportionally higher in poorer, disadvantaged populations (12,13). This does not reflect any characteristic virulent trait of the virus, but is a reflection of inequalities in modern society (11,14,15). Risk factors for more severe Covid-19 infections, such as obesity, are also more prevalent in lower socioeconomic population groups (16).

At the time of the writing of this article the vaccines are already knocking at our doors, but again not on all doors (17). Many African health officials and politicians express concerns that many individuals in their countries might see the vaccine only with a delay of months (maybe even years)—if at all—despite different initiatives such as COVAX. Some developed countries bought many more vaccines than needed to vaccinate their whole population. Prioritization concepts are discussed and "inequality" and "self-protection handicaps" will and should be included in the list of vaccination priority application (18). In a recent article the costs of implementing a new vaccine in an expanded program of immunization in Sub-Saharan Africa was estimated to show an interquartile cost range of USD 0.54 - 2.31 (19). The future will tell whether this price range is too high for certain countries. The situation around Covid-19 and therapeutic / preventive options has led to "vaccination diplomacy" on the global political stage, creating new dependencies, new inequalities and new geopolitical imbalances.

A meaningful orientation for any future improvement of the livelihood of all global citizens should be the UN Declaration of Human Rights. There are most likely not many documents which have been translated into more than 500 different languages! Covid-19 showed us once more that it is not enough to translate a document into another language; at the end of the day only implementation counts. We all know how well these thirty articles are implemented at a global level. It is the latest chance to make this Human Rights Declaration the guiding principle and benchmark for all our activities. Respecting human rights would even reduce the virulence of Covid-19 and many other diseases—which knock already on many doors but once again not on all doors. Any investment in the implementation of the Human Rights will nearly automatically immediately improve progress towards most—if not all—sustainable development goals (SDG) (13,20-22). During the 55 years of the existence of the Nestlé Foundation, the thirty articles of the Human Rights have always been a guiding principle for our work and decisions, and they will remain so during the post Covid-19 years.

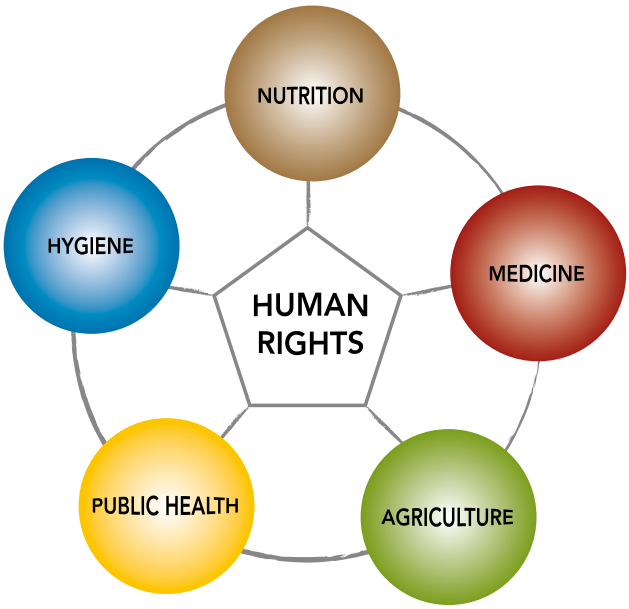

Figure 1
The enLINK circle: The five central elements for a better livelihood–human rights represents the key to success.

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THE enLINK LIBRARY

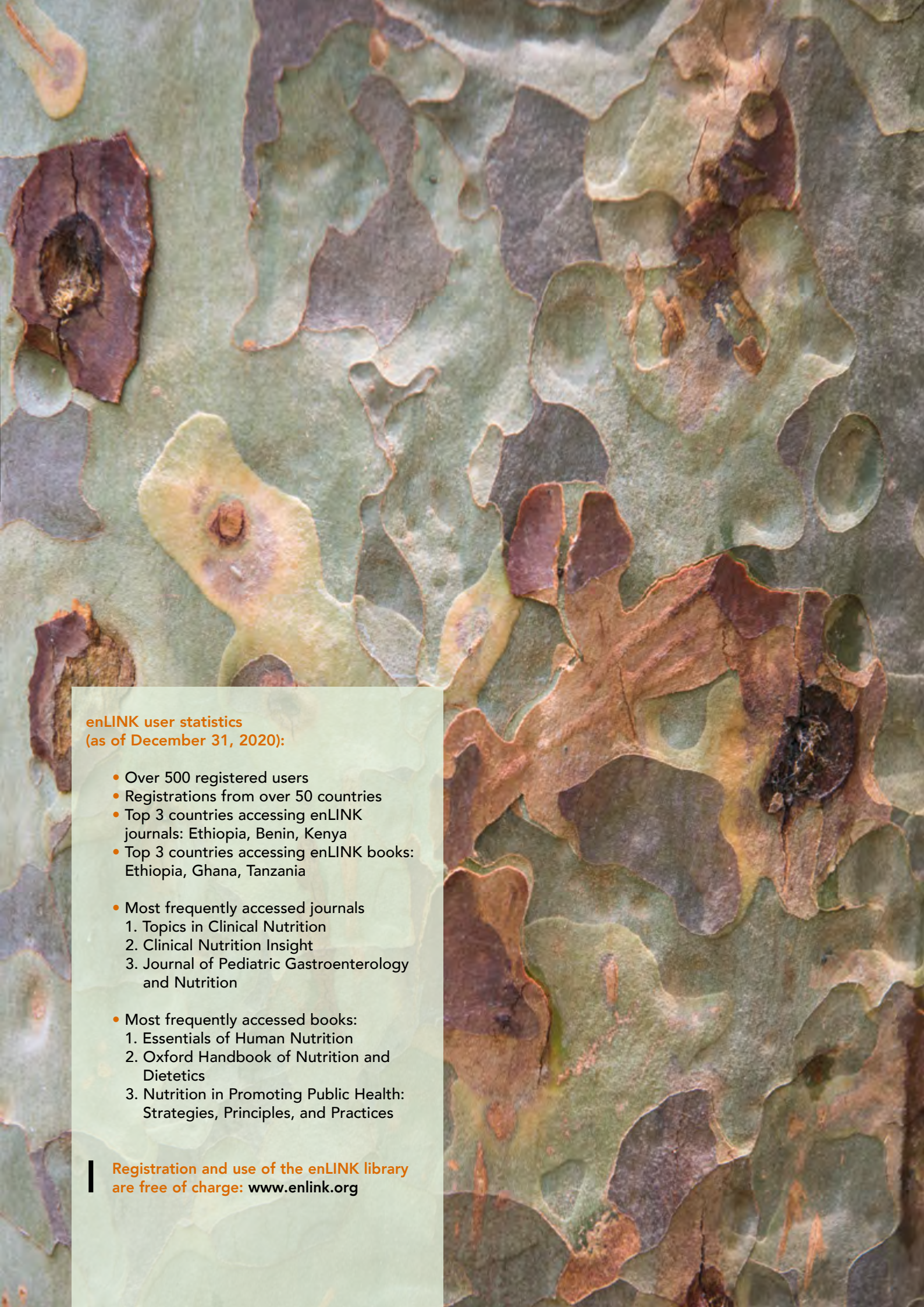
ON DIGITAL INEQUALITY

During 2020 the digital enLINK library remained a potentially useful basic information source for many users in low-income countries—until Covid-19 struck. During the first months of the year the enLINK library was used as in former years; however, with the spread of Covid-19 and the shutdown of most universities, libraries and schools, the usage dropped and has remained low. Interestingly, the books were used much more than the journals, perhaps indicating a need for more basic knowledge acquisition and less research-related reading.

Due to the acute global turbulences caused by Covid-19, a sharp drop of the usage rates of information and communication technology (ICT) resources seems to be quite normal; however, prima vista a longer period of low usage seems unusual. According to different statistics Covid-19 put a brake on most global academic activities—including library usage. However, within a short time frame there was a tremendous shift to distance learning and remote access to all kinds of ICT-based teaching tools—many of them urgently developed in response to the new challenges. Many universities and whole countries scaled up their ICT competences in the educational sector.

However, a closer examination and informal exploration of some enLINK users revealed that the prolonged low usage rates are actually a proxy for the digital divide and internet- and ICT-access inequality in many countries, especially in rural Africa (2). The enLINK library usage is limited to users in low-income countries. Universities all over the world worked hard to set up ICT-based teaching facilities. In highly developed countries this was already a huge challenge and many universities succeeded quite well, but as we all know the "weakest link in a chain determines its strength". Even in rich economies "digital poverty" and "digital inequality" (1,2) was not thought of: also in rich countries many students are not able to connect and participate in the higher education activities offered online by their universities as they lack basic digital infrastructure and decent and affordable internet access. In a recent study from the UK it was found that a large percentage of students experienced lack of one or more of the basic infrastructural requirements such as appropriate hardware, appropriate software, access to the internet or to technical support, or also an appropriate space to study without disturbance (1).

We all know that ICT access is an important basic requirement for most forms of learning, successful exams and last but not least also a well-functioning economic system. "Unfortunately" the latter applies to all geographic areas, but as we know there is a huge digital divide both within as well as between countries, especially also between the North and the South (2, 3, 4). Access to ICT and the availability of the needed infrastructure should not be a luxury good but a basis for advancement and development at the individual but also national level. Whether the latter is a good or bad development is open to discussion. It is a fact in the modern world and once more we should assure that everybody can get access—whether an individual chooses to



enLINK user statistics (as of December 31, 2020):

- Over 500 registered users
- Registrations from over 50 countries
- Top 3 countries accessing enLINK journals: Ethiopia, Benin, Kenya
- Top 3 countries accessing enLINK books: Ethiopia, Ghana, Tanzania

- Most frequently accessed journals
  1. Topics in Clinical Nutrition
  2. Clinical Nutrition Insight
  3. Journal of Pediatric Gastroenterology and Nutrition

- Most frequently accessed books:
  1. Essentials of Human Nutrition
  2. Oxford Handbook of Nutrition and Dietetics
  3. Nutrition in Promoting Public Health: Strategies, Principles, and Practices

Registration and use of the enLINK library are free of charge: www.enlink.org

use it or not is a personal decision, but it should be available and affordable.

In this context one has also to raise the question of the ideal library for the future—is it purely digital or is a "hybrid" or "blended" library with a mix of books and digital media better? An interesting question, but one which cannot be discussed here in more detail. In any case a library is more than a tool for accessing educational materials—a library is a place for meeting and exchanging with colleagues in vivo; libraries are a space which put the mind in a learning mode and "curiosity mode", crucial foundations for any advancement. It is well known that absolute "digital enforcement" is most likely not the ideal solution (5). In the past the Foundation distributed the well-known and much appreciated enLINK book trunks. Maybe it is time for a revival?

Digital poverty is a much larger problem in low-income countries and there is a huge risk—especially as the pandemic continues—that many young students and scholars will not be able to advance in their education and studies; some are already even speaking of a lost generation of students. In rich economies ICT infrastructure was driven to perfection using the latest innovation. Yet to access a library one does not need the latest technology, not the fastest internet, not a mobile computer—simply a desk, a computer and adequate internet connectivity. Why is this not available in many places in Africa or other lower-income countries? Why is ICT pushed in rich countries and not in the educational non-profit sector of poorer economies? This is a question which bears examination.

Even the humble enLINK library of the Foundation cannot fulfill its aims due to external circumstances which should not be a barrier. For decades many agencies and organizations have spoken about development, advancement, modernization, poverty reduction, improved livelihood, etc.—we all know these slogans. After decades of development assistance, though, Covid-19 is revealing the gaps and the many unachieved goals or even wrongly formulated aims. Maybe we all have to perform a strategic review and define new aims and tasks for the future—paying attention to the real human values—and decide what global society we want and how future societies should look alike: equal or unequal. The foundation for the reduction of these disparities is education.

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NEW RESEARCH PROJECTS

In 2020 the Council decided to fund 11 research projects:

COMPOSITE NUTRIENT POWDER

FOLATE & NTD

GROWTH FAILURE & EED

PROMOTION OF BREAST FEEDING

SCHOOL GARDEN

OVERWEIGHT & PREGNANCY OUTCOMES

NEW RESEARCH PROJECTS

MALNUTRITION & PHYSICAL FUNCTION

POSITIVE DEVIANCE & GROWTH

NIXTAMALIZATION

COMPLEX RICE SYSTEMS

VILLAGE DOCTOR EDUCATION

COMPOSITE NUTRIENT POWDER

Effect of composite-foods powder intake on the nutritional anemia and growth status of young Ghanaian children

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College of Health Sciences
University of Ghana
Legon (Ghana)

USD 65,368

Nutritional anemia of iron and vitamin-A deficiency is of public-health significance among Ghanaian children. It may be aggravated by malaria parasitaemia, hookworm and food insecurity. The plausible causes are: (1) poor bioavailability of non-heme iron from plant staples; (2) seasonal variations in availability, accessibility and consumption of vitamin-C rich fruits and vegetables; and (3) inadequate intake of fish and animal products. One primary option to control nutritional anemia could be the consumption of available, accessible and affordable composite-foods powder consisting of anchovies, eggplant, carrot and soybean flours. This randomized controlled study proposes to investigate the effect of such a composite-foods powder on anemia attributable to iron and vitamin-A deficiency and on the growth of Ghanaian kindergarten pupils aged 36-59 months who are free from malaria parasitemia infection and hookworm infestation at baseline. The experimental group shall consume stew and soup containing composite-foods powder and the control group shall consume stew and soup devoid of composite-foods powder. Primary outcome variables shall be blood hemoglobin, ferritin and retinol concentrations. Secondary outcome measures shall include anthropometric indicators of growth, dietary intakes, C-Reactive protein, malaria parasitemia infection and hookworm infestation.

FOLATE & NTD

Folate and vitamin B12 assessment among women of reproductive age in Eritrea: A 2020 population-based study

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and

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USD 28,877

Nutritional status of women of reproductive age (WRA) is an important measure of maternal and newborn wellbeing. Micronutrient malnutrition is widespread and it affects mainly young children and WRA. Folic acid (FA) and Vitamin B12 are among the most important micronutrients. Their deficiency may not be clinically evident, but has detrimental effect for newborns and WRA. FA plays a central role in the synthesis and methylation of nucleotides that intervene in cell multiplication and tissue growth. FA deficiency affects the development of both the cranium and spinal cord, and consequences are termed as neural tube defects (NTD). Many countries have introduced wheat-, maize- and rice-fortification programs to eliminate this deficiency and have made significant reduction in NTDs. Studies suggest that optimal maternal folate status reduces the risk of NTDs in offspring. Lack of surveillance and incomplete ascertainment of folate-deficiency-affected WRA makes its impact invisible to policy makers in developing countries. However, scientific evidence concerning status of FA and vitamin B12 deficiency and NTDs remains limited. Available studies suggest wide geographical variations in the prevalence of such conditions, with higher proportions in low-income countries and considerable differences within regions and countries.

A flour-fortification program, a community-based measurement of folic acid and vitamin B12 as a NTD-prevention strategy has not been implemented so far in Eritrea. Thus, assessing folate and vitamin-B12 status of WRA of a community for which natural food provides the main sources of folate and vitamin B12 is very supportive for nutritional evaluation, monitoring and reducing the risk of diet-related multi-factorial diseases. This project is endorsed by the research division of the Ministry of Health, Eritrea.
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GROWTH FAILURE & ENVIRONMENTAL ENTERIC DYSFUNTION

Assessing causal relationship between environmental enteric dysfunction (EED) and growth failure in children from Rukwa-Tanzania: A cross talk between EED and stunting

Modern Grantina
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USD 20,000

Undernutrition affects 25% of children in the developing world and has been associated with half of all deaths worldwide. The long-term effects of stunting in early childhood have been associated with cognitive and physical growth deficits across generations. Models depicting use of all known interventions to tackle undernutrition, including vitamin A and zinc supplementation, complementary feeding, breastfeeding promotion and micronutrient supplementation in pregnancy, have shown that their use in 99% of children would only decrease stunting by 33% worldwide, clearly indicating that there is a large knowledge gap in our understanding of stunting and its associated causes that cannot be explained solely by food insecurity. Different methodological approaches will be used to assess a causal relationship between environmental enteric dysfunction (EED) and growth failure in children from Rukwa. This will be a prospective cohort study: the population will involve children aged one to two years who will be prospectively followed for one year. The study areas will be divided into two follow-up arms, namely administrative wards with poor water, sanitation and hygiene (WaSH) services (Arm 1) and those with improved WaSH (Arm 2). Children's height and Z scores will be measured at the beginning and end of the study, to determine linear growth. A structured questionnaire will be used to collect data on socio-economic status, anthropometry, WaSH services, child's breastfeeding and morbidity.

PROMOTION OF BREAST FEEDING

Promotion of exclusive breast feeding and young child feeding practices through m-Health: A randomized controlled trial

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USD 50,000

Early life nutrition is the key modifiable determinant of child growth, development, survival and diseases of adult onset. Pakistan ranks highest for neonatal mortality rate (44.2/1000 live births (LBs)) globally. One third of under-five deaths are attributable to the high prevalence of stunting (38%), underweight (23%) and wasting (7%), greatly related to feeding practices. Given the low prevalence of exclusive breastfeeding (EBF) (48%) and use of minimum acceptable diet (13%), mitigation of early life nutritional risk through promotion of EBF and Young Child Feeding Practices (YCFP) represents an opportunity for intervention. Secondary Care Hospitals (SCH) of the Aga Khan Health Services Pakistan provide essential maternal and child health services for a low-middle income population. Babies born at these SCHs are followed up for vaccination, growth-monitoring and other services at the closely affiliated Family Health Centers (FHCs) run by Lady Health Visitors (LHVs). The study will examine the effectiveness of a locally designed m-Health application for empowering mothers to improve child nutritional care as a potentially sustainable approach. The first six months of formative research would identify perceptions, barriers and facilitators for EBF and YCFP using self-determination behavioral theory, among multi-parous pregnant mothers enrolled at three SCHs of Karachi. A randomization trial would be conducted during the next 18 months among near-term pregnant women who have access to smart phones. A culturally appropriate m-Health application called First Diet would be developed to provide personalized push messages delivered weekly by the LHVs. The non-intervention group will receive face-to-face nutritional counselling by the research staff at FHC following the routine vaccination and growth-monitoring schedule. If proven effective, m-Health would be incorporated in routine child care provision by LHVs.

PAKISTAN

SCHOOL GARDEN

Enhancing food literacy among Sri Lankan adolescents: Effect of school gardens in promoting healthy diets, behaviours and knowledge

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USD 79,695

Poor diet quality and low physical activity are common among adolescents, which leads to a high prevalence of micronutrient deficiencies and an increasing prevalence of risk behaviors of non-communicable diseases. Adolescence is a critical time in the lifecycle, during which individuals gain independence and develop skills and learn behaviors that will last the rest of their lives. Recently the enhancement of 'food literacy' has emerged as an effective means of tackling the aforementioned issues. An ideal model could be the integration of this approach into the education system as a school garden. The benefits of school gardens for food literacy, students' dietary outcomes and lifestyle behaviors have shown mixed results. School health and nutrition programs conducted in Sri Lanka are already integrated with school-based food gardens, although effective institutionalization and evidence of using them to promote food literacy competencies of children are not available. It is hypothesized that effectively established, integrated and sustained school gardens will promote educational activities and as a result will improve food literacy, eating habits and lifestyle behaviors of secondary school children. The objectives of the study are (i) to develop a model that captures how gardens are effectively established, integrated and sustained in schools; and (ii) to investigate the effect of a well-established school garden linked to nutrition promotion activities (intervention) on improving food literacy and improved dietary, health and lifestyle outcomes in secondary school children. After studying the present practices a successful school garden model will be developed and established in ten schools and will be compared with control schools pursuing standard school garden practices.

OVERWEIGHT & PREGNANCY OUTCOMES

An urban picture of overweight, gestational weight gain and pregnancy outcomes among slum and non-slum dwellers in Pune, India

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USD 49,340

Every third urban woman of reproductive age in India is overweight. In women, overweight increases the risks related to pregnancy and childbirth. Although 17% of urban Indians reside in slums, there are few studies comparing early-pregnancy overweight, gestational weight gain (GWG), physical activity (PA) and diet and their combined impact on pregnancy outcomes in the slum setting. To guide the planning of weight management interventions for urban young women, prospectively collected epidemiological data on diet and PA throughout the pregnancy are needed.

This doctoral research project will estimate the prevalence of overweight in early pregnancy, pattern of GWG, diet, PA and adverse pregnancy outcomes among pregnant women residing in slums in urban Pune, India. The association of overweight and GWG with pregnancy outcomes will also be studied. A cohort of 500 pregnant women (<12 weeks of gestation), registering at three antenatal clinics, will be enrolled. The study is intended to estimate the prevalence of overweight using Asian cut-offs and to observe its association with commonly observed pregnancy complications such as pregnancy-induced hypertension and gestational diabetes. Data on socio-demographic factors, weight, height, GWG, pregnancy and postpartum complications and outcomes will be collected at booking, during each trimester and at post-delivery. During pregnancy, 24-hour dietary recalls will be noted and PA data will be collected using the Global Physical Activity Questionnaire in a subgroup.

MALNUTRITION & PHYSICAL FUNCTION

Long-term effects of acute malnutrition on physical function: A 5-year prospective cohort study in Ethiopia

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USD 19,995

Although a community-based management of acute malnutrition (CMAM) program has been shown effective in improving catch-up growth and reducing mortality, very little is known about the long-term prognosis of children with acute malnutrition (AM). Evaluating the long-term prognosis of children with AM is critical to understand functional outcomes that have important implications for economic productivity and the risk of nutrition-related chronic diseases in later life. The overall aim of this project is to examine long-term health and nutritional outcomes (growth, body composition, metabolic dysfunction, cognitive function and physical function) in two cohorts of children who experienced AM. Currently, the researchers have completed the evaluation of growth, body composition and cognitive function outcomes. This study will add the evaluation of the effects on physical function indicators. In this study, we hypothesized that survivors of moderate or severe AM would have lower levels of physical activity five years after recovery, as compared to community controls matched by age, sex and village. For this purpose, two prospective cohorts of children aged 6-59 months who have been under follow-up since 2013 will be assessed. The first cohort is children who had severe AM and received treatment under a CMAM program and their controls (n = 439), while the second cohort is children who have moderate AM and their controls (n = 925). Level of child physical function will be assessed using the Actigraph accelerometer.

POSITIVE DEVIANCE & GROWTH

Positive deviance in linear growth of children aged 6-23 months in Rwanda

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USD 19,996

Child growth retardation continues to be a public health concern globally. Worldwide, 144 million children were stunted in 2020, among them 57.5 million from Africa, where 57 million are from sub-Saharan Africa. In Rwanda, 35% of children below five years were stunted in 2018. It is possible that the households of the remaining 65% of children who are not stunted engage in a positive behavior that makes them succeed in child linear growth. The purpose of this study is to identify practices among households of children aged 6-23 months with growth outcomes that make them positive deviants (PD) in Rwanda.

This cross-sectional study will be conducted in five districts of Rwanda: one district will be selected in each of the four provinces of Rwanda and one district in Kigali City. The districts with the highest prevalence of stunting will be selected. A total sample of 877 mother-child pairs will be recruited using a multistage sampling combined with systematic random sampling with proportionate allocation. Data to be collected are sociodemographic and economic characteristics, child feeding practices, household crop diversification, hygiene and sanitation, maternal psychosocial characteristics and anthropometric measurements. The study aims to identify practices that enable positive deviance outcomes in linear growth.

NIXTAMALIZATION

Enhancing nutritional benefits and safety of maize to improve the health of Africans

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USD 35,585

This small-scale implementation proposal aims to 1) test the feasibility of utilizing nixtamalization to reduce aflatoxin and fumonisin exposure in Ugandan villages; 2) establish consumer willingness to consume products made from nixtamal maize; and 3) establish the factors that may affect consumers' knowledge, attitudes and behavior regarding the utilization of nixtamal maize products. It is based on the results of our Nestlé Foundation (2018-2019) Pilot Grant, which investigated appropriate nixtamalization methods for Ugandan maize and found the methods to be effective in producing safe, nutritious, and acceptable maize products. Results showed that nixtamalization of maize, using slaked lime and local wood ash, significantly reduced levels of aflatoxin (up to 90%) and fumonisin (up to 80%) and greatly improved the nutrient content, by increasing niacin levels to more than 80%. Experiments amongst University participants found the process did not affect the sensory properties of porridge or posho prepared from nixtamal maize. We know from previous studies that basic knowledge of aflatoxin and the necessary actions needed to minimize exposure throughout Uganda are extremely low.

We hypothesize that the process of nixtamalization could provide rural Ugandan consumers with superior food products and positively impact their health if they understood the health benefits. Factors and types of nudges or information that would promote the adoption of the nixtamalization process amongst communities outside a University setting need to be studied. Such knowledge would provide valuable information needed to roll out a widespread education campaign promoting the adoption of the nixtamalization process which could lead to a significant reduction in levels of cancers, immune suppression, and child malnutrition in Uganda.

COMPLEX RICE SYSTEM

A methodological framework to transform monoculture into a complex rice system landscape in East Java, Indonesia

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USD 46,854

Complex rice systems (CRSs) are advanced polycultures that combine azolla, fish, ducks and border plants into rice production systems to augment ecological processes of nutrient recycling, weed and pest suppression. Augmented ecological processes produced from mutual interactions among those combined species enable them to replace agrochemicals that are harmful to humans, animals and the environment. Moreover, CRSs could foster ecosystem services of diverse food and nutrition provisioning, reconciling the importance of safeguarding food and nutrition security while protecting the environment at the same time. Notwithstanding the benefits offered by CRSs, previous studies on CRSs have identified that knowledge, initial capital, short-term labor burden and community awareness are trade-offs for farmers who adopt CRSs. However, those studies were performed at on-farm levels, which makes it difficult to suggest how to deal with the trade-offs. Here, a landscape approach study is proposed to elucidate how farmers will deal with the potential trade-offs and how different farmers will adapt and adopt CRSs. A methodological framework to transform rice monoculture into CRSs at landscape scale will be employed in this study. A four-step method will be applied, including (i) farm characterization to understand the local context of rice farming systems; (ii) assessment of stakeholder willingness to adopt CRSs as a foundation to negotiate different scenarios; (iii) scenario co-construction to integrate stakeholder interests to increase their commitments; and (iv) redesigning actions with on-farm training and participatory experiments to put CRSs into the rice farm landscape. Various statistical analyses will be used in each step as well as landscape and agroecology matrices to evaluate the quality of the agroecological landscape.

VILLAGE DOCTOR EDUCATION

Effect of an educational intervention about child nutrition on the knowledge, attitude and practice of village doctors

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USD 15,072

Undernutrition is regarded as the most important risk factor for child illness and death. Studies have indicated that correct and adequate nutrition advice for caregivers can help to reduce child undernutrition. In China, village doctors, who serve on the front line of health care provision, are responsible for providing nutrition services for rural residents. Insufficient or even a complete lack of professional nutrition training is a key limiting factor for village doctors to provide nutrition services. Although China has invested significantly into improving rural medical service in the past decades, nutrition education is often overlooked in village doctors' training.

The aim of this project is to investigate the effect of an education program about child nutrition on the knowledge awareness, attitude and practice (KAP) of village doctors. They will recruit 142 village doctors and randomly allocate them to the intervention or control group. Six sessions of nutrition education (about 36 hours of training) will be provided for the doctors in the intervention group at six consecutive weekends. Those in the control group will receive the routine work training only. The KAP of village doctors before and after the study will be determined to evaluate the efficiency of the educational intervention. Furthermore, the changes of KAP at different time points (two months, six months and one year) will be determined as well to investigate the sustained effect of the training. Educational intervention will enhance the nutrition knowledge and behavior of village doctors and improve the quality of nutrition service in rural China, which may have a positive effect on the health status of children in the long term.

OTHER ACTIVITIES

One of the major aims of the Nestlé Foundation is the transfer of sustainable capacity-building knowledge to low-income countries through the promotion of nutrition research. During 2020 a few general and specific capacity-building activities were supported. Covid-19 affected the work and activities of all of us, but capacity-building activities continued as circumstances allowed.

DISSEMINATION OF RESEARCH RESULTS

Due to Covid-19 hundreds of meetings have been postponed or cancelled, and many have moved online. All of us have experienced the advantages but also the disadvantages of the virtual meeting (un-)reality. Undoubtedly the meeting reality of the future will change, with some hoping for more virtual meetings and others hoping and yearning for more physical meetings. At present nobody knows the best answer; most likely it will prove to be a compromise mix of virtual and physical that turns out to be the most meaningful and also most promising approach. Nevertheless we all know that we thrive with direct physical contact and personal exchanges, since we are all humans and do not want to become computer-zo(o)mbies. The critical and constructive discussion of these basic questions is very important. However, at the same time we should also critically evaluate the meaning and purpose of scientific meetings: the major aim should be the advancement of science and generation of knowledge, and also establishing personal networks. Often meetings become a place to promote certain commercial solutions and products, overshadowing knowledge generation that will benefit independent capacity. We should remember that only local capacity, without any external dependencies, will lead to a better livelihood. Without educational possibilities, schools, libraries, books, etc. for many young individuals — independent of where they live — the future is "stolen".

Most of the Foundation's projects were and are based on personal contacts, personal assistance, personal motivation and last but not least personal respect for independent work. Based on so many rich personal relationships, even during the present Covid-19 pandemic the Foundation has been able to fulfil its mandate.

As in the past, during this reporting period the Foundation has continued to cover publication fees and page charges in different journals for research projects supported by the Foundation.

CENTRE DE PROMOTION DE SANTÉ (DR CONGO)

Dr. Courtejoie worked for decades as a medical doctor in the Congo, and for many years now also as one of the main generators and promotors of educational materials for health professionals. Medical doctors, nurses, midwives, students from a wide range of disciplines and many laypersons all over the DR Congo appreciate the printed educational materials from the institution of Dr. Courtejoie and Roger Mabiala Zimuangu. As a physician in the Congo for more than 50 years, Dr. Courtejoie became aware of the importance of direct patient care but at the same time also of preventive medicine and the implementation of the significant knowledge regarding the prevention of tropical diseases and iron deficiency as well as maternal and child care. Thus he and his team became key players in the creation of educational materials for this huge country. The vast practical experience over decades guided the team to build high-impact educational materials. In view of the gaps in medical and nutritional educational tools in the DR Congo the Council decided to support the printing and the distribution of a compilation of medical books and books on prevention for midwives and nurses. One key recommendation, which the team gives to school directors, is to not put the books in a closed library but rather in an open space so that the students can read and study at any time. Even a stolen book fulfills its purpose as long as it is read.

BOOK DONATIONS

There is not only an ongoing discussion around virtual vs. physical scientific meetings but also whether physical textbooks will die and be replaced by e-books. Again both approaches have their value and legitimation. Also during 2020 researchers in low-income countries asked for printed books instead of e-books for different reasons, including persistent IT problems. Thus the Foundation paid for these books—a very much appreciated action. The role of printed educational materials is also reflected in the fact that the annual report of the Foundation is an appreciated source of knowledge and even included in libraries.

NFR4D STUDIES

The first NFR4D project at USSEIN University in Senegal is advancing, albeit with an unexpected delay due to Covid-19. Despite a lockdown situation at the University, the project is advancing and the food technology aspects of the study have been completed. Cookies fortified with local iron sources have been developed and the recipe and production method are available for a school-based intervention as soon as Covid-19 allows. This project should build local capacity and especially explore local, efficient and affordable solutions to improve nutriture. We all know that fortified products with a commercial premix are expensive and in the long run not affordable and not sustainable. The NFR4D project at USSEIN looks for a local solution.

The 2020 Report reflects a unique and historic year, which will hopefully result in a reorientation of humankind and hopefully a better world for all. No life without food: Dr. Jan Douwe van der Ploeg discusses the complexity of the modern food system and urges us to redesign the system for future generations; it is now or never, and there is a lot at stake. Diseases of poverty are on the rise again and should, despite all global turbulences, not be forgotten, as outlined by Dr. Cyrin Enwonwu. Aging is a universal phenomenon and the only certainty in our lives. Dr. Ben White discusses issues around the aging of the farming population, such as how the aging of famers is affecting food production. Despite the global turbulences and effects on food security, there is hope: as Dr. Urs Niggli urges, it is time to pay more attention to the huge potential of an agroecological approach to revolutionize the present food system and bring it back to a level of harmony with evolution, nature and humanity. It seems that the world is at a crucial intersection — let's choose the right path for the health of the individual and last but not least also planetary health.

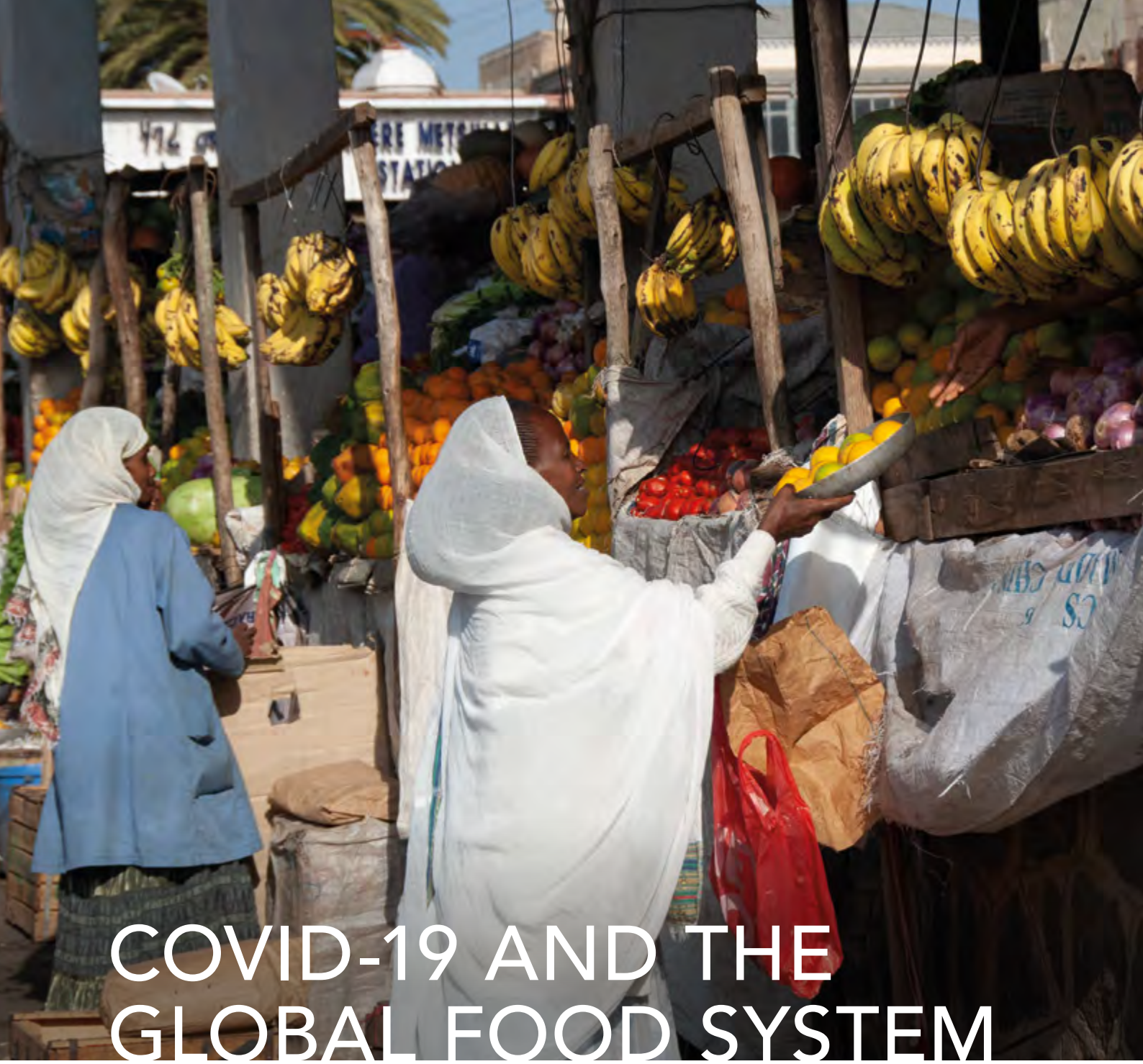
VISION

COVID-19 AND THE GLOBAL FOOD SYSTEM

DISEASES OF POVERTY

THE AGING FARMER

AGROECOLOGY



COVID-19 AND THE GLOBAL FOOD SYSTEM

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Covid-19 has revealed a series of structural weaknesses of the current food system. Many of these have been mitigated through massive support programs, whilst others, so far, have remained largely invisible. On the one hand it is amazing and laudable that large parts of the system have kept functioning—on the other hand, the revealed weaknesses need to be understood as an urgent wake-up call, as in the years to come sudden, but persistent, crises will continue to threaten the global food system. These recurrent crises will be related partly to climate change, but will also emerge out of the legacy of the current crisis, whose damaging effects have been largely shifted to the future.

The Covid-19 pandemic is resulting in a cascade of effects. Some are immediate (and occurred

in the first few months that immediately followed the outbreak). Other effects are already observable and will surely persist over the next three to five years. And then there will be the long-term effects, which will confront us with further enormous challenges.

The first months that followed the outbreak saw sudden, sharp and unexpected reductions in food exports (notably grains); huge losses of food (due to abruptly emerging mismatches between supply and demand as exemplified by the case of potatoes); the persistent paralysis of widely ramified and long supply chains (e.g. calf meat); the withdrawal of large capital groups (e.g. companies for export credit assurances); a closure of slaughterhouses (due to high contamination risks); frictions in food-processing industries (due to the just-in-time deliveries of ingredients and additives); an immediate lack of poorly-paid rural workers (causing the loss of entire harvests of fruits and vegetables); and the widespread danger of food shortages, undernutrition and hunger (the 'hunger pandemic' signalled by David Beasly of the World Food Programme). Underneath all of this there were the hidden, but probably even more dramatic, effects of the chaotic return of many millions from the metropoles of the Global South to the rural hinterlands (see e.g. Burneo and Trelles, 2020 (1)). These desperate people were often returning to their places of origin and driven by the need to find, at least, a bare subsistence level.

If these first, immediate effects could be perceived as resulting from the pandemic itself, the (initial) standstill and (subsequent) lockdowns, the emerging medium-term effects (that we are witnessing right now) cannot be understood as just resulting from the pandemic. They result from the interaction of Covid-19 and the specific way that that the food system is organized (4). Covid-19 has turned out to be a giant spotlight that has ruthlessly highlighted the vulnerabilities of the food system. In a way Covid-19 is just the catalyst of a systemic crisis that was already lying dormant in the specific features of the food system itself.

In this respect I want, firstly, to look at the rigidity of primary production. The combination of low prices (that followed on from the Covid-19 crisis) with high and rigid levels of external input use and high financial costs (stemming from a high degree of indebtedness) has put many farmers in a situation of very low, or even negative, cash flows (as occurred before in 2008/2009 as a consequence of the financial crisis). In the short run this has been remediated by bringing forward payments, postponing financial obligations and by very massive state support, but the associated burdens will need to be dealt with in the productive cycles to come. This brings increased levels of vulnerability — especially among large-scale farms that supply the major food industries and supermarkets.

Secondly, large retail organizations have shown a remarkable lack of agility. They could and cannot adequately adapt to the abruptly changing needs of growing segments of the consuming public. This is reflected in the substantial and enduring growth of alternative distribution channels such as farm shops, peasant markets, pick-and-pay and direct delivery systems. Following the outbreak of Covid-19, these alternative channels in Europe have experienced increases of between 70 to 100% in sales. They are offering what supermarkets cannot, and could not, deliver: places that are not overcrowded, products that are fresh and unprocessed, a modality of shopping that is experienced as joyful and as leisure and, probably, the feeling that one was actively engaged in avoiding contagion.

Thirdly, the weaknesses of large food processing industries (often organized in networks that span the globe) have also been revealed. These are partly rooted in their high levels of indebtedness, their lack of financial buffers (the recent turmoil in which a food company was engaged showed such buffers to be a danger that can easily provoke take-overs (6)) and the primacy of share-holder value. As I argued above, an economic recession (whatever its cause) can easily trigger deactivation in the food industry. The artificialization of food (and the associated dependency on complex supply lines) represents another source: on the one hand artificialized (i.e. highly processed) food assumes a complex array of extended supply lines, and on the other hand it relies on large retailers as its main outlet channel (5).

Fourthly, the sudden increase in undernutrition and hunger has become persistent. In the Global South the effects of lower harvests in 2020 and the lack of means to prepare for the cycles to come will increase food shortages. In the Global North food banks are hardly able to meet the steady increases in demand. Although no direct responsibility can be assigned for either of these sad facts, the global food system is increasingly and obviously unable to feed the world.

In the longer term we are facing a global food system that is entrapped in path-dependency. There is the urgent need to adapt and actively respond to a context that has changed radically, but it simultaneously shows that the food system as a whole, especially the part that operates globally, is poorly equipped to engage in the required transitions — let alone to direct them. There is a multitude of tenacious problems that are to be addressed. I want to refer here to just two of these many problems, mainly to show the complexity of the problems ahead.

One problem (so far hardly taken into account by international institutions and debates) relates to the return (signalled above) of many millions to the rural areas of their countries. These people are basically trying to find refuge in self-subsistence. Since there are hardly any job opportunities (be they formal or informal), food production, even when it is poor and little, for direct consumption in the household, emerges as the only remaining possibility. This situation will most likely continue in the years to come. This requires firm policies that help to develop subsistence production to such a degree that it will generate a marketable surplus as well (in order to obtain money to pay for education, health expenses, clothes, etc.). It also requires market agencies interested in capturing these marketable surpluses and able and willing to pay remunerative prices. The problem, though, is that there are, at the moment, hardly any such agencies, nor the needed policies. In contrast with prevailing wisdom*, over the last five decades or so policies nearly everywhere have focused on directly enlarging the production of cash crops and, especially, export crops (both requiring expenses that put these beyond the possibilities of the poor). Hence, new designs are urgently needed: new policies and new institutional frameworks (2).

Another, equally exemplary, problem resides in the centrality of artificialized food. On the one hand it has become the raison d'être of food-processing industries and large retailers. It creates a need for food to travel long distances through time and space, creating long, often global, supply lines. It is equally associated with the drive for cost reduction. Within this pattern, highly centralized production is obvious and self-evident. It is difficult to even imagine food industries that do not centre on highly artificialized food and further artificialization. On the other hand, though, it is likely that the provisioning of food will drift away from the large retailers and become more centred on fresh, non- (or hardly) processed food that stems from smaller, localised, peasant-like units of production. Making the change towards such a new, drastically altered, pattern will require completely different logistics as well as a redefinition of responsibilities at different levels of aggregation. This will represent a major challenge and a very difficult one – mainly because there cannot possibly be an overnight shift from the old towards a new pattern (3). The two will need to co-exist for a longer period (representing double costs and all other kinds of frictions).

Whether the existing food industries will be able to realize such a (partial) transition remains to be seen. They may or may not be able to achieve this. The years to come will show the outcome. They will be decisive years. But there is a lot at stake.

(* The approach adopted in the past by classical agronomists was to focus on developing the subsistence component first. Only if the productivity of both land and labour within this subsistence component was satisfactory, would there be space for market-oriented production. They considered that trying to directly induce and strengthen the production of cash crops, whilst ignoring the subsistence component, would be in vain or backfire on itself.)

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DISEASES OF POVERTY

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POVERTY AND MALNUTRITION IN SUB-SAHARAN AFRICA: IMPACT ON ORAL HEALTH CHALLENGES IN UNDERPRIVILEGED CHILDREN

Sub-Saharan Africa, with an estimated population of more than 1.34 billion people and a growth rate higher than 2.5% per year in 2018, has an average poverty rate of about 41%. This region contains most of the poorest countries in the world. There is a close reversible relationship between poverty and health which is mediated by nutrition. Included in the broad range of malnutrition are extreme hunger, undernutrition and obesity (1). Oral and dental diseases presently constitute a serious global health crisis with 3.9 billion people affected (2). Periodontal diseases, which include gingivitis and periodontitis, are among the most common diseases of humankind and they are known to share the same risk factors as many of the noncommunicable diseases (NCDs) (3,4). This report examines a unique form of periodontal disease known as necrotizing ulcerative gingivitis (NUG) which is very prevalent in socioeconomically deprived children in sub-Saharan Africa. NUG is considered a major precursor of noma. Necrotizing

Figure 1: NUG involving the mandibular incisors

ulcerative gingivitis in Africa disproportionately affects underprivileged children 3 to 8 years of age, has a prevalence rate as high as 12-18% in some rural communities, and may display marked seasonal variability. In NUG, the inflammation starts at the interdental gingivae and progresses to destroy the alveolar bone and surrounding tissues. Figure 1 shows a picture of NUG involving the mandibular incisors in a malnourished African child with evidence of poor oral hygiene. This disease in the acute stage is characterized by pain, fetid breath, fever, ulceration of the gingival papillae and lymphadenopathy. In technically developed countries, NUG is seen mainly in adults exposed to the stress of military life. NUG in children in Africa is believed to be attributable to periodontal bacteria and herpes viruses (5). Chronic malnutrition in children promotes an increased number of mouth anaerobes with a prominent proportion of organisms in the Prevotella genus. Based on available published data, we have proposed a tentative scheme to explain the occurrence of NUG in malnourished Nigerian children (Figure 2). As shown in the scheme, a complex three-way relationship exists between Infection, Nutrition Status, and Host Resistance to infections resulting in compromised oral health immunity. Poor children in sub-Saharan Africa with NUG often present with higher than normal blood and saliva cortisol levels, as well as reduced circulating levels of several micronutrients (6,7). The latter is in part an attempt by the host to withhold nutrients from pathogens (8). The stage leading from a purely intra-oral lesion of NUG to noma is still poorly understood.

Fresh noma in children

Diagnosis of early noma in children is predicated on clinical manifestations. Important suggestive clues include facial swelling with or without pain, excessive salivation, and recent or concurrent systemic disease as well as malnutrition. There are at least three stages of noma, which may overlap with each other: an acute stage, a gangrenous phase, and a scarring phase. The first phase is associated with mouth soreness and a medical history frequently marked by illnesses such as diarrhea, malaria, measles, tuberculosis, herpes, or HIV infection. During the gangrenous stage, there is extensive intra-oral destruction of tissues. Some noma cases may present with ectopic lesions involving the scalp, neck, shoulders, vulva, and other sites. The scarring phase leads to trismus and facial disfigurement. Sequelae of noma depend on the severity and extent of tissue destruction as well as the sites affected. They may include displacement or exfoliation of the dentition, bony

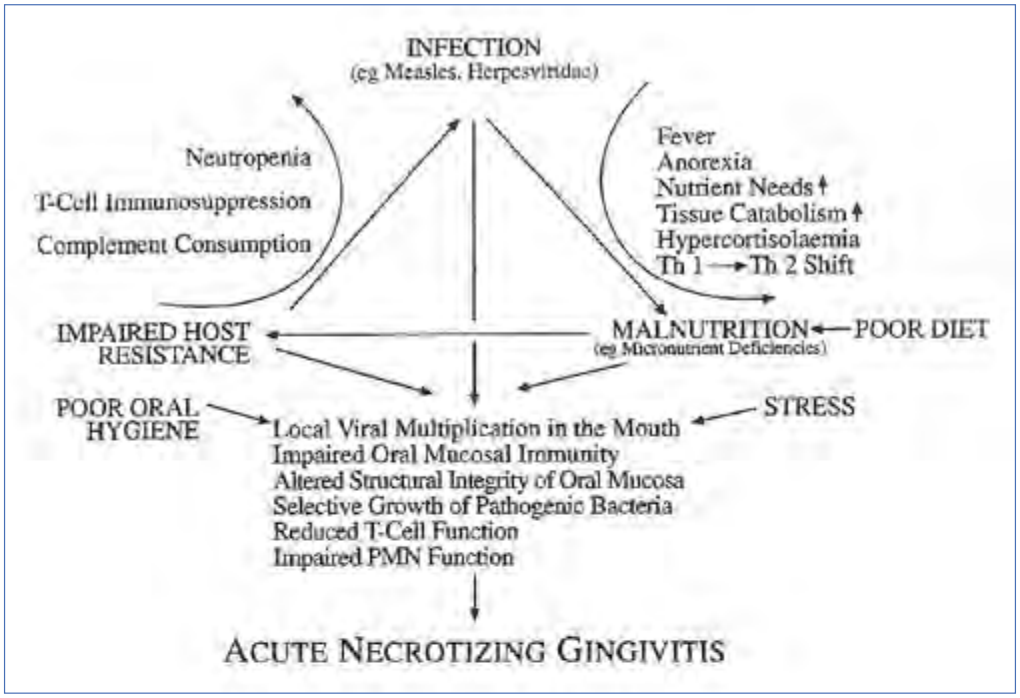

Figure 2:
A causal scheme to explain the occurence of necrotizing ulcerative gingivitis (NUG)

fusion between the maxilla and mandible, poor speech, and feeding difficulty. Persistent leakage of saliva may constitute a major problem in patients with extensive destruction of the maxilla, lower lip, cheek, and floor of the mouth (7).

A WHO International Consultation has reclassified the stages of noma as follows: ANG (NUG) stage with or without fetid breath, ulceration of the gum, pain and increased salivation; edema stage with fever, rapid extension of the gingival and mucosal ulcer; gangrenous stage; and sequelae stage (9). Mortality rate from noma is as high as 90% unless appropriate therapy is promptly carried out.

Figure 3:
Oro-facial noma

Figure 3 depicts a case of oro-facial noma in a 2.5 year old with a recent history of measles and malaria prior to the rapid development of externally visible, destructive gangrene of jaws and face. The boy was markedly growth-retarded with a length of 74cm and body weight of 8.0kg, both lower than the reference values for a 2-year old child. A cross-sectional study of untreated fresh cases of noma and their age-matched village counterparts showed that linear growth retardation, which usually characterizes underprivileged African children, was significantly more pronounced in the former group. In the age groups 1 to 4 and 4 to 8 years, the percentages of noma children < - 2.0 SD were 91% and 67%, respectively (P < 0 001). The corresponding values for the latter village group without noma were 37% and 24%, respectively (10). The peak age incidence of fresh noma in sub-Saharan African children is 3 to 4 years. The infancy phase of human growth which starts at mid-gestation tails off at about 3 years of life. The prevalence of low birth weight attributable mainly to intrauterine growth retardation (IUGR) is quite high in African children at risk for noma. The disease is not transmissible and is not seen in privileged children except in those with HIV infection.

The WHO International Statistical Classification of Diseases, code A69.0, lists necrotizing ulcerative stomatitis, which includes noma, cancrum oris, and fusospirochaetal gangrene. Noma was an ancient global disease which virtually disappeared from the rich developed countries by the mid-20th century prior to the discovery and use of penicillin. The disappearance coincided with improvements in the living standard. By contrast, the disease has remained an escalating health problem in deprived African children residing in a belt, which stretches across western and central Africa towards Sudan. Most of the countries in this hot and arid zone are characterized by mass poverty and frequent famines. In Niger, Nigeria, Ethiopia, Sudan and Senegal, for example, a few specific regions account for most of the noma cases in the countries. The noma cases may be related to HIV/AIDS, which compromises nutritional status through a reduction in food intake.

PREVENTION: Prevention of noma in children requires attention to routine health care needs, optimal sanitation, adequate nutrition, immunizations, and public health awareness. Health care personnel should be able to screen children for the risk factors, which include the following:

1. Severe growth retardation in the first 6 to 12 months of life
2. Poor eating habits and sign of severe malnutrition
3. Persistent diarrhea
4. Presence of oral mucosal ulcers, particularly involving the gingivae
5. Malodorous breath

Proper oral hygiene practices should be promoted. When use of toothbrushes and toothpaste is not economically feasible, children should be taught how to use indigenous soft chewing sticks or sponges efficiently. Many of these chewing sticks are fashioned from plants known to contain active medicinal chemicals; several are from the tea plant family and capable of concentrating fluoride from the soil. For infants, cotton buds may substitute for chewing sticks.

Sanitation inside and outside of the residential quarters requires careful attention to the following issues:

1. Clean drinking water must be readily available
2. Human waste must be removed in a timely fashion
3. Livestock should be segregated from human residential quarters. In many poor communities where noma is highly prevalent, infants and children are reared under abysmal conditions resembling a dirty pigsty.

As oral ulcers are frequently associated with antecedent infections, administration of routine

immunizations is also a priority. Other vaccines include DPT (diphtheria, pertussis, tetanus), Haemophilus influenzae serotype b (Hib), and polio vaccine.

Adequate nutrition should be enforced in the first three to six months of life and breastfeeding should be encouraged. Weaning foods for infants should be prepared under strict hygienic conditions.

Noma in African children is a socio-economic disease occurring almost exclusively among very poor victims usually from uneducated polygamous homes. Such families often interpret any disease within the framework of superstitious beliefs. Information campaigns are therefore necessary at the village and national levels if diseases like noma are to be eradicated from the vulnerable communities.

TREATMENT: For acute fresh noma, this involves the use of appropriate antibiotics, wound care, replacement of lost fluids and electrolytes as well as nutritional rehabilitation. Reasonable antibiotic regimens are penicillin in combination with metronidazole or streptomycin. Some favor a combination of amoxicillin and metronidazole. Others prefer monotherapy with metronidazole. For children who can swallow oral medication, antibiotics may be given in tablet or syrup form. Dosing for penicillin VK is 25 to 50 mg/kg/day in three divided doses; dosing metronidazole is 30 mg/kg/day in three or four divided doses. For children who cannot tolerate oral medication, parenteral therapy with procaine penicillin is recommended (25,000 to 50,000 units/kg/day in divided doses, not to exceed a total of 4.8 million units/24 hours).

Wound care implies daily dressing of the ulcer with gauze soaked in antiseptic. If possible, the mouth should be rinsed daily with a solution of chlorhexidine digluconate (0.12 to 0.20%), and continued for up to one week. Management of fresh noma requires prompt rehydration and correction of electrolyte abnormalities followed by nutritional rehabilitation with a high protein diet, enriched with essential micronutrients. Feeding by mouth is preferred. If this not possible due to pain, tissue destruction, or severe trismus, parenteral nutrition may be administered

SURGICAL REPAIR: The goal of surgery is to improve cosmetic appearance as well as oral functions including speech, eating, drinking and swallowing. In the acute phase, intervention for control of secondary hemorrhage, removal of loose teeth and wound debridement may be needed to prevent secondary infection and promote healing. More definitive surgery is carried out after several months to one year. The delay allows enough time for the resolution of necrosis. Surgery is carried out by experts with relevant expertise. Physiotherapy to reduce fibrous scarring should be initiated during the healing phase and continued after surgery. Attention to psychosocial needs of the patient is an important component of treatment, given the cosmetic and functional debilitation resulting from the disease.

SUMMARY AND CONCLUSION: Twenty-seven of the twenty-eight poorest countries in the world are in sub-Saharan Africa. According to the UN, 688 million people were hungry in 2019, up from 628.9 in 2014. If current trends continue, more than 840 million global inhabitants may be undernourished by 2030. Poverty is a major element in the occurrence of noma in African children. The disease thrives in a background promoted by poverty, and severe immune deficiency created by synergistic interactions between malnutrition, poor oral hygiene and endemic infections such as malaria, measles and the herpes viridae. Noma has throughout its long history occurred in every continent where and when these conditions existed. Primary prevention of this disease in children seems simple since noma is hardly encountered in well-fed children from the same ethnic group. Chronic gingivitis in an underprivileged sub-Saharan African child is potentially a very serious health problem that may rapidly evolve into noma unless the host is treated appropriately.

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THE AGING FARMER

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AGEING FARMERS, RURAL YOUTH AND FARMING FUTURES

The young people in this photo are transplanting rice in the Javanese village of Kaliloro. They are the grandchildren of the men and women farmers whom I studied as a young PhD student in the early 1970s. Most are still in secondary school, and they are the first generation of children in this village who have never helped their parents working in the fields. So why are they now busy planting rice? I will come back to this later.

In 2019 the FAO launched the "United Nations Decade of Family Farming 2019-2028" (UNDFF). One of the seven "pillars" of the UNDFF Action Plan for the next 10 years is to "support youth and ensure the generational sustainability of family farming". This reflects an awareness of a potential generational problem in the world's farming, which is seen as having two inter-related dimensions: first, all over the world, smallholder farming populations are getting older; and second, it seems that rural young men and women today are not interested in farming futures. This raises the question: will there be a next generation of smallholder farmers? Or will smallholder farming be abandoned by the new generations, leaving big agriculture and multinationals to take over?

Today's generation of young men and women are on the front line: they will have to cope with the effects of environmental and climate change, as well as labor-displacing technologies which are likely to accelerate and intensify during their lifetimes and those of

their children. COVID has exacerbated pre-existing problems, including the youth unemployment crisis, with youth unemployment rates on average three times those of adults before COVID-19. Despite what we hear about young rural people's turning away from farming, farm work and the broader agri-food system are still by far the biggest employers of young rural men and women.

What about the ageing farmer problem? In many countries, in a single generation there has been a halving in the proportion of farm heads under 35 years of age, and a doubling of those over 55. The most commonly assumed explanation of this shift is that farmers' sons and daughters are unwilling to take over the farm, so that they have to continue farming into old age. But it may also be that farmers are now living and/or staying healthier longer, and are unwilling or unable to hand over the farm to the next generation, so that the next generation has to wait longer and longer before taking over the farm. Are the old unable to stop because the young are unwilling to start, or are the young unable to start because the old are unable or unwilling to stop?

What do we know about the situation of young rural men and women today, and about how they envisage their futures? Various multi-country surveys of rural young men and women's "aspirations" all conclude that young rural people overwhelmingly express an aspiration for secure, formal-sector jobs. And in their reported aspirations farming comes very low on the list, if at all.

Today's rural youth undoubtedly have wider horizons than their parents and grandparents did. But most current generations of adult farmers, when they were young, also had some idea of a better, non-farming future, at least if they had access to formal education. Rural schools are one place—but not the only place—where rural life is downgraded, and children are taught to aspire to urban lives and office jobs. In fact, we can probably say that "wanting not to be a farmer" has been a constant in the lives of the children of smallholders (and an aspiration of parents for their children) since rural children started going to school, or at least since they started going to secondary school.

When the same surveys of rural youth aspirations have asked more concretely "what would make farming an attractive option for you?" farming emerges as a possible option, but only if certain conditions are fulfilled: land and inputs must be available, farming must be at least in part commercially oriented, and farming must be combined with other income sources.

Young people's desire for an independent economic existence is strong. They are not content with a life-course in which after leaving school or college they help their parents on the family farm, waiting until they are maybe 40 years old and their parents die or become too weak to farm, and they can take over the land. It's not surprising then that so many young rural people migrate out of the village after leaving school.

This photo shows some young men, women and children in a village in Burundi, where one-third of young men and more than half of all young women do not expect to inherit land. Many of the young men, and a smaller number of young women, had made the difficult and dangerous journey to Tanzania to earn income. How did young men in this village describe their aspirations?

> We want a future as farmers, but if we would have other activities to help, that would be better because farming is not enough. … If there was an organization to help us learn a vocation, we could work and have money to buy land before the others do so and there is no more land.

So these young people looked for non-farm opportunities not to replace, but to complement, farming, and indeed to make farming a possible future.

In Kaliloro village, only a small handful of today's younger farmers had no experience of out-migration prior to making a start in farming, and most did not make a start as independent farmers until their late 20s or early 30s. One of the youngest farmers is Yaya (24 years old). After completing secondary school, she left the village to work as a shop assistant, and

then in a food stall; after some years she married and returned to the village. She is now a share tenant on her father-in-law's land, giving him one-half of the crop; she has been the "main" farmer from the beginning, her husband being mainly occupied with other work.

The typical "young farmer", then, in many parts of the world, is an ex-migrant. This points to the importance of seeing the generational problem in agriculture in a life-course perspective.

If there is to be a future for farming styles and rural economies driven not by corporate profits but more by the interests of smallholder livelihoods and social and ecological benefits, there has to be a new generation of (would-be) smallholder farmers willing to take up the challenge. But new generations of rural youth will turn away from agriculture if governments continue to neglect the smallholder sector and they do not see a prospect of sustainable smallholder-based livelihoods and welfare.

A commitment to smallholder farming futures means first of all, substantial government support to smallholder farmers and provision and protection of their access to emerging markets, and to the added value that is generated not only on the farm but also in the upstream and downstream activities in agri-food chains. It means curbing, and where necessary reversing, corporate land grabs and the near-monopolies of large-scale agribusiness. Supporting the generational sustainability of smallholder farming means recognizing young people as actors and citizens, and potentially a powerful force in the revitalization of smallholder farming. In supporting young would-be farmers we should take into account their multidirectional mobility between places and sectors, and their desire for pluriactive livelihoods combining farm and non-farm incomes. It also means creative investment in rural infrastructures to make rural areas attractive places for young men and women to live and work.

It also means providing land and other agrarian resources to young men and women would-be farmers while respecting the interests and needs of the older generation. There are many examples of such initiatives. Some involve the breaking up of large-scale and inefficient holdings in favor of smallholder cultivation, and the allocation of some or all of this land to young would-be farmers. In countries and regions where many older farmers have no successor and where younger would-be farmers are looking for ways to establish themselves in farming, 'matching' and mediation initiatives facilitating extra-familial farm transmission between generations are becoming increasingly important. And some governments have allocated reclaimed upland or desert lands to young farmers.

Finally, some initiatives have provided access to land for collective farming by youth groups. In Uganda for example, Rivall Uganda Limited makes short-term lease agreements with landowners and then informs youth groups about the availability of the land, connects them to buyers of farm produce, and recovers payment through the sale of the

produce. The collective nature of the farms created in this way is important. Besides promoting a shift from economies of competition to economies of co-operation and solidarity, it responds to contemporary young people's mobility between places and sectors which means that not all the young farmers have to be permanently tied to the farm: "Working with groups has been key to the success of the initiative. Aggregating youth in groups boosts morale and means that when some group members are unable to participate in farming the land, others will continue the work".

And finally, what were those young teenagers doing, planting rice in Kaliloro village? In all Indonesian villages there are youth groups called 'Karang Taruna'. They are expected to be active in organizing sports, preparing for the national Independence Day festivities, etc. But four years ago, in one corner of Kaliloro village, the local Karang Taruna decided to rent some land from the village government, and to plant rice as a source of income. These teenagers—who as I said, in most cases had never helped their parents in the fields—came in large groups to plant the rice, to weed it, and to harvest it. Despite their lack of experience, they have achieved harvests no smaller than that of the neighboring farmers; they are now into their eighth planting season and this is their second season of shifting to organic production.

Recently they have developed a "nested market", offering their produce directly to urban consumers on Instagram, and they have started offering training sessions for young people from the neighbouring youth groups, beginning with teaching them how to make high-quality organic fertilizer.

Examples like this give reason for optimism that it is not farming or rural life as such that young people are allergic to. They do not want to spend their youth and young adulthood helping their parents in a position of dependency, and maybe in future they do not want to farm in the same ways that their parents farm. But they—or at least some of them—are willing to consider other styles of farming for the future.

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AGROECOLOGY

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HOW DOES AGROECOLOGY BALANCE PRODUCTIVITY AND SUSTAINABILITY?

Introduction

The global production of food comes at the expense both of non-commodity ecosystem services and long-term eco-stability, through the overexploitation of natural resources and high greenhouse gas emissions, along with deforestation and land degradation (1). Indeed, agriculture production has become the main driver of terrestrial, and in certain places even coastal, biodiversity losses. This means that managing trade-offs between high productivity and improved environmental outcomes is becoming a key challenge for the growing world population.

Agroecological farming systems, increasingly promoted by scientists, advisory services and farmers' groups alike, offer powerful means to answer this challenge.

What characterizes agroecological farm practices?

Agroecological farming methods are a dynamic transformation process, grounded in the FAO's 10 elements (2). These set out a model that relies centrally on ecosystem functions like soil fertility and biodiversity, with off-farm inputs playing a diminished role in production. Agroecological farms apply sustainable best practices, such as diverse crop rotations, mixed crop-livestock systems, polycultures, inter-, cover- and mixed cropping, natural or semi-natural habitats and corridors for flora and fauna. In general, diversity of the landscape and habitats, of farm activities, of crops grown, of livestock kept and of above and below ground flora and fauna is a defining feature of this approach. Indeed, diversity seems to be the single most important characteristic related to food productivity, ecological sustainability and economic resilience. Also important are local breeding programs and the re-use of resources from local agroecosystems (3). Agroecological farming methods include permaculture, low external input sustainable agriculture (LEISA), agro-silvo-pastoral systems and sustainable pastoralism in rangelands, agroforestry and organic farming. Integrated pest management is also a feature of the agroecological model, if implemented as a combination of biological, biotechnical, plant breeding and cultivation measures. These reduce the application of chemical plant protection products to a bare minimum.

In terms of objectives, there is a fairly large overlap between the farm management methods mentioned above. However, some differences come into view when using multi-criteria analyses to measure their sustainability performance in qualitative and quantitative terms. In terms of farm techniques, on the other hand, there remains quite a high degree of inconsistency. Some farmers practice combined fertilization with organic manure and synthetic fertilizers or the spraying of synthetic pesticides in exceptional cases, such as a risk of a severe harvest loss. Organic farmers, in contrast, eschew such combinations and exceptions. Genetic engineering in plant and animal breeding is rejected in the majority of agroecologically oriented farming approaches because the patenting of seeds monopolizes reproduction, use, sale and distribution of newly invented plants and impedes subsequent breeding activities with the same trait. Here, the rapid development of novel genome-editing techniques with single-base substitution, deletion, duplication and insertions might change the negative perception of genetic engineering in the breeding process. There are also major differences in the economic orientation and strategic positioning of agroecological farms. While some are geared towards the increasing demand in the world markets for sustainably and fairly produced agricultural commodities, others consciously produce for their local market in order to have a higher added value and to remain economically independent.

The role of farmers

Crucially, agroecological agriculture elevates the role of farmers in associated knowledge and value chains. Farmers in their traditional role as mere suppliers of raw materials have been slow to address the much needed transformation of food systems towards comprehensive and integral sustainability. Indeed, building social capital and new modes for the co-creation of knowledge are vital prerequisites for the successful scaling of agro-ecological farm management practices (4). Many such farmer organisations and social movements now use the concept of agroecology as an overarching political framework to ascertain their rights and safeguard locally adapted small-scale farms (5). Partnership in knowledge development and in markets is set to become the paradigm of the twenty-first century. Resultantly, the role of the academy in agricultural research will have to adapt. Disciplinary research must be complemented by inter- and transdisciplinary approaches. Scientific and technical advances must be better targeted to natural site conditions, to the prevailing cultural and socio-economic environment, and they must build on the wealth of local and farmer knowledge. Where this is practised, one observes that the boundaries between farmers and scientists become blurred. Intuition, practical know-how and scientific facts combine to provide farming recommendations that are better suited to their particular context and more quickly implemented. This improves both the quality of the products and the environment in which they are produced.

Challenges

So far so good. But how can agroecological farm practices be upscaled and mainstreamed? A successful example is organic farming, where rapid transformations of farmers have taken place in Europe over the last twenty years, thanks to support from agricultural policy and consumer demand: a classic push-and-pull strategy. In Europe as a whole, 3.3% of the farmland is organic; in the EU this is 8.1%. In ten EU countries, more than 10% of the farmland is now organic. Indeed, regional peaks of 25% and more have been achieved in the Alpine

countries, e.g. in the region of Salzburg in Austria and in the Canton of Grisons in Switzerland, where approximately half of the farmland is organic (6). Encouraged by these developments, the European Commission has set a target of 25% by 2030 in the Farm-to-Fork and Biodiversity Strategies for the whole European Union.

Although organic farming is a good example for agroecological farm practices, it is, by design, unlikely that sufficiently high yields can be reached. Yield deficits of 15 to 25 percent create a serious risk that a very high proportion of organically managed land in Europe could lead to a shift of agricultural production elsewhere and thus also to an export of environmental pollution, biodiversity losses and negative climate effects.

In general, the trade-offs between ecological sustainability and productivity are addressed by efficiency gains: "produce more with less". Such an efficiency narrative relies on strong technological innovation. However, these efficiency gains are often counterbalanced by increased consumption or wastage (rebound effects). Successfully implementing an agroecological alternative to current approaches therefore requires a combined efficiency and sufficiency strategy; especially important here is the reduction of food waste and of meat consumption (7, 8). The scale of change needed should not be underestimated. Establishing sufficient food systems will be a multi-generation project: realizing large-scale reduction of food waste and changes in consumer choices and the perceived value of food presents a significant societal challenge.

The most important agricultural achievement of the twentieth century was the decoupling of a growing demand for food from a steady growth of agricultural, especially arable, land. Plant and livestock breeding and technological innovations made this possible, though always in combination with increasing off-farm inputs. The challenge of the twenty-first century will be to maintain this productivity while reducing dependence on fertilizers, pesticides, energy, and in the case of livestock, on concentrates and antibiotics.
The FAO forecasts an additional demand of 7400 trillion kilocalories by 2050. Under the current regime of agricultural production, this would mean an expansion of agricultural land by around 600 million hectares: 400 million of grassland and 200 million of arable land (9, 10). With respect to achieving climate goals, protecting soil fertility and halting biodiversity loss, this would be a disastrous backward step.

Now more than ever, an innovative strategy based on farmer knowledge, on intact ecosystem services and on scientific progress is required. A higher land equivalent ratio (LER) with intercropping or polyculture is one of several solutions. In agroforestry systems in the tropics, annual crops (cereals, sorghum, many grain legumes, vegetables, flowers, etc.) are combined with fruit trees, wood trees for energy production, cocoa or coffee. In the scientific literature, polyculture has been reported to give yields 40 to 145 percent higher than sole cropping. A good example here is ginger, maize and soybean polyculture in Nepal (11). Meanwhile, in temperate zones, mixed cultures with only annual plants are more common. Many organic farms plant barley and pea or oats and faba bean in this way. In addition to having a slightly higher LEF, these improve the nitrogen supply along with soil fertility and physical stability. Moreover, they provide an excellent weed suppression effect, reducing the need for energy-intensive mechanical weeding.
Digitalization is a further key technology for reducing external inputs such as pesticides and fertilizers without risk to yields. Advances in robotics, GPS technology, remote sensing and hyperspectral image analysis, the speed of wireless data transmission, real-time data processing, and advances in precision of control place digital innovation at the fulcrum of agroecological farming systems' potential for sustainable growth. Mechanization is moving away from ever-heavier tractors and back to self-propelled equipment, which is constantly becoming smaller and lighter. With the traditional drive to simplify landscape structures, to grow and level out fields, and to remove "disturbing" habitats now in reverse, this new mechanization can be adapted to a diverse, small-scale landscape.

Newer breeding programs, well-adapted to the conditions of low external input cultivation systems and farms, offer further exciting possibilities. While resistance to plant pests and diseases remain key here, of equal importance is the ability of plants to interact with the soil microbiome and better profit from the microbial activity of the soil. Greater attention is paid to traits like root architecture, symbiotic fungi and bacteria in the rhizosphere. All of these offer tremendous gains in productivity, and should be a central focus in the development of agroecological practices. Whether these can be achieved by classical cross-breeding, with marker-assisted selection or with targeted mutagenesis with genome editing is ultimately a secondary question.

Conclusions

At its best, agroecology takes advantage of a multiplicity of solutions, combining technology and traditional knowledge to improve inputs and outputs of the agricultural process. Empowerment

of farmers with partnerships and co-creation of knowledge characterizes agroecological farming methods at all scales of production. It should not, then, pass without note that peasant farmers very often practice in line with these. Diversification of production is a critical strategy to reduce ecological and economic vulnerability. With this goal in mind, and especially through the potential of digitalization in farm technology, agroecological practices can and should be applied to industrial commodity production as well.

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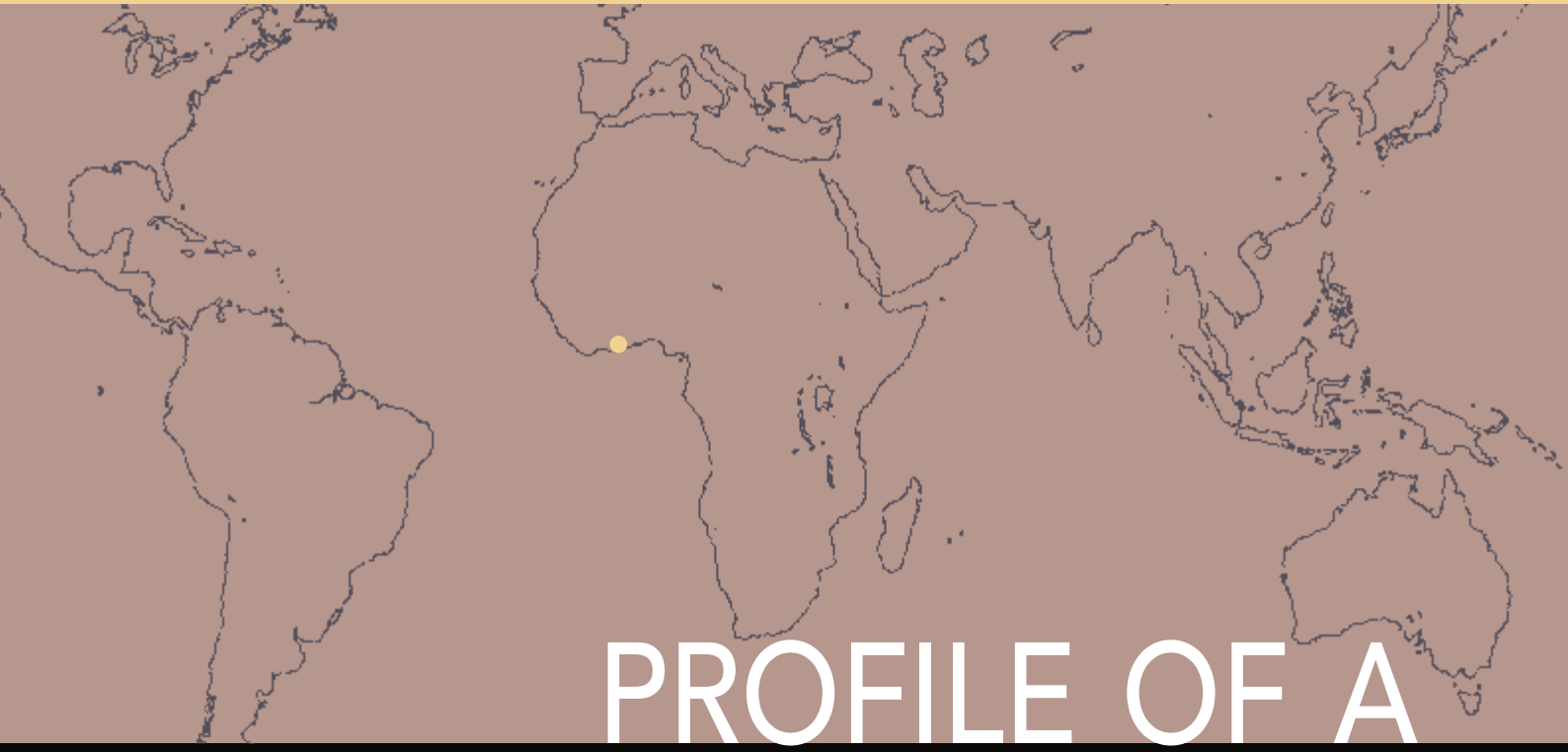

PROFILE OF A NUTRITION INSTITUTE

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Nutrition remains central to health and wellbeing, yet in many African countries, training of professionals and their placement within the health care system remains a work in progress. Hitherto, nutrition rehabilitation centres were established mainly for in-patient treatment, mostly of children with severe acute malnutrition (SAM). This approach is increasingly being surpassed by a new focus on community management of especially mild and moderately severe forms of malnutrition (CMAM), and rightly so. However, the personnel needed to provide field-based training, nutrition literacy and support for home-based nutrition are lacking for a number of reasons. Universities and other training institutions across sub-Saharan Africa have varying types of nutrition and dietetics training with different levels of certification and professional regulation. Thus, there is currently no uniformity in the training standards, expectations and even job prospects and placement of graduates with a 'nutrition qualification'.

In Ghana, there is to a large extent, a clear understanding of the important role of nutrition in health care. This is reflected in the government's health and nutrition policy documents and the focus of its National Development Planning Commission's (NDPC) commitment to embedding nutrition within national development policy. The need for training nutrition professionals is well understood and at least five major public Universities have nutrition programmes from undergraduate Diploma to doctoral level training, including the University of Health and Allied Sciences (UHAS).

UHAS is a young public University established in 2011 with a clear mandate solely as a 'health university'

GHANA

AREA

Total:	238,537 km^2
Agricultural land:	69%
Arable land:	21%

POPULATION

Total (July 2020 est.):	31,372,899
Urban population (2018):	57%
Under age 15:	37%
Median age:	21.4 years (Male 21 years / Female 22 years)
Net migration rate (per 1000) (2020 est.):	-0.325
Rate of urbanization (annual rate of change, 2015-2020 est.):	3.34%

POPULATION GROWTH RATE

Total (2018 est.):	2.26%
Total fertility rate (2021 est.):	3.71 children born/ woman

GDP

(per capita, PPP) (2019 est.):	USD 5,413

LIFE EXPECTANCY AT BIRTH

Total: 69 years

Male: 67.3 years / Female: 70.7 years

MORTALITY RATES

Neonatal mortality rate:	23.1/1000
Infant mortality rate (at birth) (2018 est.):	33.3/1000
Under-five mortality rate:	46/1000
Maternal mortality rate (2017 est.):	308/100,000 live births

MICRONUTRIENT DEFICIENCIES

Households consuming iodized salt (DHS 2016):	63.9%
Vitamin-A supplementation (full coverage, 2017):	50%

OTHER PARAMETERS

Population below poverty line (2013 est.):	24.2%
Rate of urbanization (rate of annual change):	3.34%
Mother's mean age at first birth (2016 est.):	22.3 years
Contraceptive prevalence (2017):	30.8%
Health expenditure (% of GDP, 2018):	3.5%
Physician density per 1000 population:	0.14
Immunization, measles (% of children ages 12-23 months):	92%
Proportion of children < 5 years sleeping under insecticide-treated bed nets:	~45%
Total adult literacy rate:	79%
Population using improved sanitation facilities, 2015, total:	14%
Population using improved sanitation facilities, 2015, urban:	19%
Population using improved sanitation facilities, 2015, rural:	8%
Adult HIV prevalence (2019 est.):	1.7%
Obesity (adult prevalence rate 2016):	17.1%
Internet users (% of the population, 2021 est.)	50%

to train a range of health care professionals. The University's vision is to become a pre-eminent research and practically oriented health educational institution dedicated to the training of health care professionals. To ensure this, the University enshrined within its business model Vocational Training (VT) as a central core to training: to expose its students to the field where people live and work, and to have first-hand experience of the environment and its possibilities and challenges. In addition to eighteen undergraduate programmes run in six schools, UHAS has established an Institute for Health Research with expertise and a reputation for quantitative and qualitative research.

Two Schools of the University provide nutrition-related training: one involving the training of clinical nutritionists and dietetics professionals (School of Allied Health Sciences, SAHS); the other with an emphasis on nutrition training with a public health focus (The School of Public Health, SPH). The School of Public Health also boasts the Research Centre for Neglected Tropical Diseases, which has an international reputation relating to drug discovery, and is one of only a few US-FDA approved clinical trials centres in sub-Saharan Africa.

So, the next question is, being such a young and vibrant institution, how is the University contributing to nutrition training and research in Africa?

The School of Public Health (SPH) is mandated by the Ministry of Health and the Ghana Health Service to train nutrition officers and other public health professionals working in the health directorates across a country with a population of thirty million. Most of these 'sandwich students' hold Certificate or Diploma certificates and are provided further advanced training to upgrade them to degree level to make them more effective and competent professionals. Through the Vocational Training programme, all students in training are attached to health directorates and work with preceptors, who serve as their field mentors and supervisors. The University faculty conduct field visits to monitor their work and progress and to see at first-hand the impact of their training in improving nutrition and health at the municipal, district and sub-district/community level.

Faculty members in the Department of Family and Community Health (DFCH), which hosts the SPH Nutrition programme, are internationally renowned nutrition and public-health professionals with extensive global experience. The Department of Family and Community Health is led by inspirational people and has a strong research culture based on the application of fundamental scientific principles to address issues of family and community health, nutrition, diet and disease and mental health.

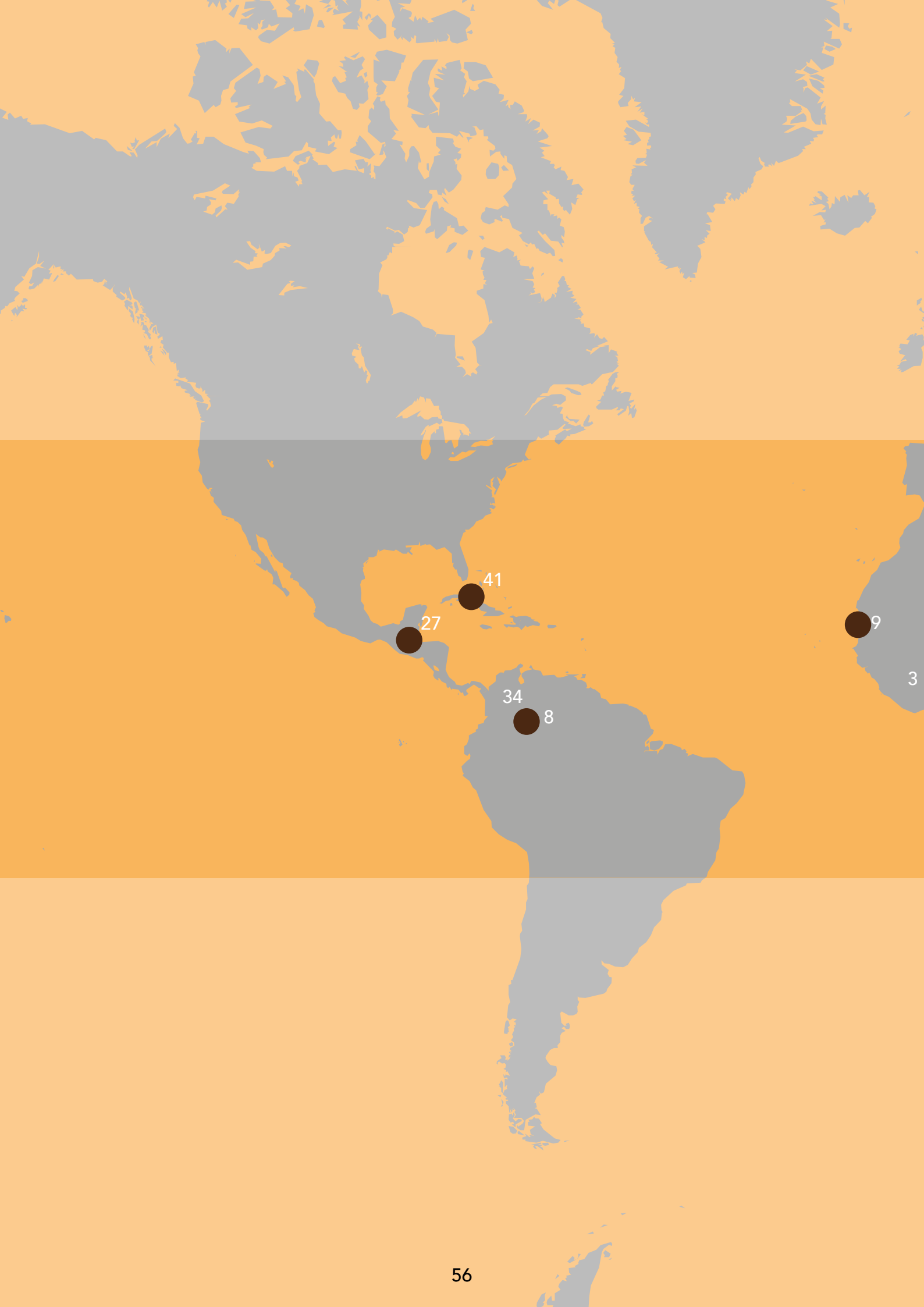
At the heart of the SPH nutrition programme are two dynamic stalwarts who both have global standing amongst the nutrition community in the persons of Professor Paul Amuna, Dean, SPH; and Professor Francis B. Zotor, Head, DFCH. Indeed, Professor Paul Amuna was one of the earliest recipients of a Nestlé Foundation Scholarship when the program was first established in the 1980s. He provides institutional and research leadership for public health as a whole and nutrition in particular. He and Professor Francis Zotor provide visionary leadership and mentoring of new and young faculty as well as inspiration for the students to strive to achieve the highest standards of scholarship. Together, they lead a team of highly qualified nutritionists and other experts who occupy roles at the global level and serve on a number of national and international boards.

Over the eight years of its existence, the UHAS and SPH have established a thriving postgraduate training programme in field epidemiology (MPhil) and public health (MPH). The latter includes a 'Nutrition Option', aimed at strengthening capacity for middle-level nutrition leadership and management at the District and Regional levels of the health system in Ghana. Furthermore, the Ghana Tertiary Education Commission (GTEC), the accreditation body for institutional programmes, has recently reviewed the University's new PhD programme in Public Health, which provides opportunities for doctoral-level training and research to meet current and emerging needs and challenges including in nutrition. The goals include to train learners who are 'health systems ready', service- and research-oriented, and dedicated to attaining universal health coverage for Ghanaians. UHAS believes in strong national and international research and educational partnerships and a number of these have been established with institutions in Africa, Europe, USA, Canada and South Korea, including joint research and doctoral-level training. We are keen and happy to be associated with the Nestlé Foundation and wish to collaborate in areas of mutual benefit in nutrition training, online training and web-based educational collaboration, research and scholarship.

Nutrition at the School of Public Health offers interactive courses and programmes that aim to provide comprehensive training in public health nutrition and to give students a solid grounding in the knowledge and skills required for the workplace. Our programmes offer students in-depth education covering the underlying principles and evidence base, concepts and theories of nutrition, and their relationship to health and wellbeing. This integrated programme covers dietary, public health, social, behavioural, epidemiological, physiological and biochemical aspects of nutritional science with an emphasis on their interconnectedness and multi-sectoral dimensions. Specialist topics include

maternal, newborn, child and adolescent nutrition, lifecycle nutrition including geriatric aspects, nutrition in emergencies, nutrition programme planning, evaluation and monitoring, nutritional epidemiology and nutrition-related chronic diseases.

The study of public-health nutrition at SPH provides a solid academic and practical training for a variety of careers. Our programmes are developed with input from employers and other relevant stakeholders. All our programmes are accredited by the national accreditation board and are thus quality-assured.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ONGOING PROJECTS

	TITLE	PRINCIPAL INVESTIGATOR
MICRONUTRIENTS	1 2014 / Minimizing the negative effect of iron supplementation and fortification on gut microbiota using local resources	Siti Helmyati / Gadjah Mada University, School of Health & Nutrition, Faculty of Medicine, Yogyakarta, Indonesia
	2 2018 / Efficacy of micronutrient powder formulation with low-dose iron in Bangladeshi children living in areas of high iron in groundwater	Faruk Ahmed / Griffith University, Public Health, School of Medicine, Health Sciences, Quensland, Australia
	3 2018 / Iron-biofortified fast-cooking cowpeas to reduce iron deficiency among children in malaria endemic areas in Ghana	Sylvester Addy / CSIR Crops Research Institute, Kumasi, Ghana
	4 2019 / Iodine content in salt produced in Mozambique and the producers knowledge about salt iodization health benefits	Sergio P Chibute / Eduardo Mondlane University Medical School, Department of Biochemistry, Maputo, Mozambique
	5 2020 / Effect of composite foods powder intake on nutritional anaemia and growth status of young Ghanaian children	Egbi Godfred / University of Ghana, Noguchi Memorial Institute for Medical Research (NMIMR), College of Health Sciences, Legon, Ghana
	6 2020 / Enhancing food literacy among Sri Lankan adolescents: Effect of school gardens in promoting healthy diets, behaviours and knowledge	Renuka Silva / Wayamba University of Sri Lanka, Department of Applied Nutrition, Makandura, Gonawila, Sri Lanka
INFANT AND CHILD NUTRITION	7 2013 / Formulation and characterization of infant flours using spirulina powder in replacement of multivitamin-mineral complex	Evariste Mitchikpe / University of Abomey Calavi, Department of Nutrition & Food Sciences, Cotonou, Benin
	8 2017 / Nutrition, anemia, growth and oxygen weaning in Low Birth Weight oxygen-dependent infants in a Kangaroo Clinic	Nathalie Charpak / The Kangaroo Foundation, Bogota, Colombia
	9 2018 / Development of complementary foods based on local products to improve iron status of school-age children in Senegal (NFR4D)	Moussa Ndong / USSEIN University of Sine Saloum El Hadj Ibrahima Niasse, Bureau de Liaison, Dakar, Senegal
	10 2019 / Does early initiation of homemade yogurt supplementation prevent stunting – a pilot randomized controlled trial	Kaniz Khatun E Jannat / icddr, b, Infectious Disease Division, Environmental Intervention Unit, Dhaka, Bangladesh

INFANT AND CHILD NUTRITION

MATERNAL NUTRITION

TITLE	PRINCIPAL INVESTIGATOR
11 2020 / Assessing causal relationship between Environmental Enteric Dysfunction (EED) and growth failure in children from Rukwa-Tanzania: A cross talk between EED and stunting	Modern Grantina / Nelson Mandela African Institution of Science and Technology (NM-AIST), Tengeru, Arusha, Tanzania
12 2020 / Positive deviance in linear growth of children aged 6-23 months in Rwanda	Jean de Dieu Habimana / University of Rwanda, Department of Human Nutrition, Remera Campus, Kigali, Rwanda
13 2020 / Effect of nutrition education of village doctors on health status of children	Li Lei / Xiamen University, Public Health School, Xiamen, PR China
14 2010 / Pre-conceptional vs gestational food supplements and pregnancy outcomes in rural Vietnam	Tu Ngu / National Institute of Nutrition, Department of Applied Nutrition and Nutritional Surveillance at the National Institute of Nutrition, Hanoi, Vietnam
15 2013 / Impact of pre-pregnancy micronutrient supplementation on infant growth and development	Phuong Hong Nguyen / Thai Nguyen Medical School, Thai Nguyen, Vietnam
16 2017 / Underlying causes of poor dietary intake, nutritional status and birth outcomes in pregnant adolescents and adults (uninvited resubmission)	Reginald Adjetey Annan / College of Science KNUST, Department of Biochemistry and Biotechnology, Kumasi, Ghana
17 2018 / Impact of preconceptual micronutrient supplementation on child growth and development	Phuong Hong Nguyen / Thai Nguyen Medical School, Thai Nguyen, Vietnam
18 2020 / Folate and vitamin B12 assessment among Women of Reproductive age in Eritrea, a population based study 2020	Kidane Amanuel / Xi'an Jiaotong University, Department of Epidemiology and Biostatistics, Xi'an, Shaanxi, P.R.China
19 2020 / Promotion of exclusive breast feeding and young child feeding practices through m-Health: A Randomized Controlled Trial	Rozina Nuruddin / Aga Khan University, Department of Community Health Sciences, Karachi, Pakistan
20 2020 / An urban picture of overweight, gestational weight gain and pregnancy outcomes among slum and non-slum dwellers in Pune, India	Deshpande Swapna / Hirabai Cowasji Jehangir Medical Research Institute, Pune, India

	TITLE	PRINCIPAL INVESTIGATOR
NUTRITION EDUCATION	21 2019 / Designing, administering and evaluation of a nutrition training package for rural women farmers in Tanzania	Hadijah Ally Mbwana / University of Agriculture, Department of Food Technology, Nutrition Sciences, Sokoine, Tanzania
	22 2019 / Maternal Health, Literacy and Pregnancy Outcomes: The Role of Specialized Nutrition Education	Ruthfirst Eva Ayande / School of Allied Health Sciences, Department of Nutrition & Food Sciences, Tamale, Ghana
	23 2020/Long-term effects of acute malnutrition on physical function: a 5-year prospective cohort study in Ethiopia	Tsinuel Girma / Jimma University, Department of Human Nutrition, Jimma, Ethiopia
FORGOTTEN CROPS / AGRICULTURE	24 2014 / The efficacy of biofortified pearl millet in a randomized controlled trial with children in rural Eastern Kenya	Mueni Hellen Ndiku / University of Eastern Africa, Baraton School of Science and Technology, Eldoret, Kenya
	25 2020 / A methodological framework to transform monoculture to complex rice system landscape in East Java, Indonesia	Khumairoh Uma / Brawijaya University, Malang, Indonesia

OTHER RESEARCH AREAS

	TITLE	PRINCIPAL INVESTIGATOR
26	2008 / Causes and control of food insecurity: a pilot model in the Northwest of Iran	Saeed Dastgiri / Tabriz University of Medical Sciences, Faculty of Medicine, Tabriz, Iran
27	2013 / Behavior change and nutrition associated with integrated maternal/child health, nutrition & agriculture program	Manolo Mazariegos / Institute of Nutrition of Central America and Panama (INCAP), Guatemala City, Guatemala
28	2013 / Healthy kitchens, healthy children: a school-based cluster randomized controlled trial	Nadine Sahyoun & Hala Ghattas / University of Maryland, Department of Nutrition and Food Science, College Park, Maryland, USA and American University of Beirut, Center for Research on Population and Health, Beirut, Lebanon
29	2014 / Nutrition Gap Map: A comprehensive mapping, quality assessment and summary of nutrition relevant systematic reviews	Zulfiqar Ahmed Bhutta / Aga Khan University Hospital, Women and Child Health, Karachi, Pakistan
30	2014 / A cohort analysis of the sustainability of food insecurity control programs in the northwest of Iran	Saeed Dastgiri / Tabriz University of Medical Sciences, Faculty of Medicine, Tabriz, Iran
31	2015 / Maternal folate supplementation and epigenetic changes in the offspring	Phuong Hong Nguyen / Thai Nguyen Medical School, Thai Nguyen, Vietnam
32	2015 / Effect of vitamin B12 supplementation during pregnancy and 6 month postpartum to improve B12 status and child development(resubmission)	Towfida Jahan Siddiqua / icddr, b, Nutritional Biochemistry Lab, Sciences Division, Dhaka, Bangladesh
33	2016 / Risk factors and associated cost of preventing childhood stunting: A case study of Buhweju district, Uganda	John Bukusuba / Makerere University, School of Food Technology, Nutrition and Bioengineering, Kampala, Uganda
34	2016 / Viral contamination of vegetables eaten raw: Sanitary impacts on the vulnerable population in Usme (Bogota)	Carlos Arturo Guerrero-Fonseca / Universidad Nacional de Colombia, Molecular Biology Virus Laboratory, Faculty of Medicine, Bogota, Colombia

OTHER RESEARCH AREAS

	TITLE	PRINCIPAL INVESTIGATOR
35	2016 / Processing and preservation of Moringa oleifera leaves for combating micronutrient malnutrition in Tanzania	Oscar Kibazohi / University of Dar es Salaam, Department of Chemical and Mining Engineering, Dar es Salaam, Tanzania
36	2016 / Vitamin A status in pregnant women eating traditionally spirulina (Dihé) in Chad	Imar Djibrine Soudy / Institut Universitaire des Sciences et Techniques d'Abéché, Laboratoire de Biotechnopôle de IRED (Tchad), N'djamena, Chad
37	2017 / Improving vitamin A intake in Northern Cameroon through nutrition education on food habits	Richard Ejoh Aba / University of Bamenda, Department of Food and Bioresource Technology, Bambili, Cameroon
38	2017 / Designing improved complementary feeding for infant and young children from locally available foods in Rural Western Ethiopia	Fekadu Gemede Habtamu / Wollega University, Food Science, Nekemte, Ethiopia
39	2017 / Consumer attitude and perception on consumption of edible insects in Western Kenya	Fanuel Kawaka / Technical University of Mombasa, Department of Pure and Applied Science, Mombasa, Kenya
40	2017 / Development of bio control approach for mitigation of aflatoxin in groundnuts using atoxigenic strains of Aspergillus spp in Tanzania	Juma Mfaume / Naliendele Agricultural Research Institute (NARI), Mtwara, Tanzania
41	2017 / In Search of an EEG Neural Fingerprint of Early Malnutrition: a 50 year longitudinal study	Pedro Antonio Valdes-Sosa / Cuban Neuroscience Center, Havana, Cuba
42	2018 / Towards introduction of "edamame", vegetable soybean, for more nutritious diets and food availability in Benin	Eric Etchikinto Agoyi / University of Abomey Calavi, Cotonou, Benin
43	2020 / Enhancing nutritional benefits and safety of maize to improve the health of Africans	Archileo N. Kaaya / Makerere University, Department of Food Technology and Nutrition, Kampala, Uganda
44	2019 / Factors Other Than Food Supply that Affect Children's Nutrition in Mongolia	Sharavkhorol Erdenebileg / National University of Mongolia, The Mongolian University of Life Sciences, Ulaanbaatar, Mongolia

OTHER RESEARCH AREAS

	TITLE	PRINCIPAL INVESTIGATOR
45	2019 /Optimizing Household Agricultural Production for Nutrition: Impacts of Nutrition Education on Zambian Households	Kelvin Mulungu / Colorado State University, Fort Collins, USA
46	2019 / The Effects of Psychosocial Stimulation on the Development, Growth and Treatment Outcome of Severely Malnourished Children age 6 – 59 Months in Southern Ethiopia: A Cluster Randomized Control Trial (EPSoSAMC Study)	Tesfalem Teshome / St Paul's Millenium Medical College, Human Nutrition, Ethiopia
47	2019 / Dietary patterns of Indonesian elderly diet and their associations with sodium and potassium intakes: A baseline study to develop a nutrition program for non-communicable disease	Dianis WULAN-Sari / The University of Tokyo, Tokyo, Japan
48	2019 / Effect of a drama-based intervention program on breastfeeding self-efficacy and breastfeeding outcomes of rural pregnant women, Ibadan, Nigeria	Yetunde Ogundairo Omotola / University of Ibadan, Department of Human Nutrition, Faculty of Public Health, College of Medicine, Ibadan, Nigeria
49	2019 / Peer groups to improve infant and young child feeding in post-emergency settlements in Uganda	Joel.J Komakech / Oklahoma State University, University of Agriculture, Stillwater - OK, USA

PUBLICATION YEAR

Davidson Sarah Melati, et al. Status gizi dan perkembangan anak usia 3-5 tahun di Kabupaten Bogor. The Indonesian Journal of Nutrition 2020; 8 (2): 143-148, e-ISSN : 2338-3119, p-ISSN: 1858-4942.

Gemede Habtamu Fekadu. Nutritional and anti-nutritional evaluation of complementary foods formulated from maize, pea, and anchote flours. Food Science & Nutrition 2020;8:2156-2164.

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Kadoukpe M, et al. Vegetable soybean, edamame: Research, production, utilization and analysis of its adoption in Sub-Saharan Africa. Journal of Horticulture and Forestry 2020; 12(1): 1-12.

Naggayi M, et al. Enhancing Nutritional Benefits and Reducing Mycotoxin Contamination of Maize through Nixtamalization. Journal of Biological Sciences 2020;20:153-162.

Montealegre A and Charpak N. Anemia, nutrition and ambulatory oxygen weaning in a cohort of oxygen-dependent premature infants. Authorea 2020, DOI: 10.22541/au.160571534.48191014/v1.

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Nabugoomu J. School Dropout in Rural Uganda: Stakeholder Perceptions on Contributing Factors and Solutions. Education Journal 2019;8(5):185-195, doi: 10.11648/j.edu.20190805.13, ISSN: 2327-2600 (Print), ISSN: 2327-2619 (Online).

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Sparta A, et al. Potential economic and nutritional benefits of complex rice systems for small-scale farmers in West Sumatra, Indonesia. Journal Biological Agriculture & Horticulture 2020; DOI: 10.1080/01448765.2020.1833755.

The publications are available free of charge upon request.

PUBLICATIONS

The Nestlé Foundation for the Study of Problems of Nutrition in the World was established in 1966 by a donation from the Nestlé Company on the occasion of its centenary. The Foundation is independent and self-constituting and is managed by a Council consisting of at least five internationally well-known scientists as Council Members. The Foundation has been financially and operationally independent of the Nestlé Company since its inception due to the endowment received in 1966. The offices of the Nestlé Foundation are in Lausanne, Switzerland.

THE FOUNDATION

GUIDELINES FOR GRANT APPLICATIONS TO THE NESTLÉ FOUNDATION

PURPOSE

The Nestlé Foundation initiates and supports research in human nutrition with public-health relevance in low-income and lower-middle-income countries according to the World Bank classification (see http://www.worldbank.org). The results of the research projects should ideally provide a basis for implementation and action which will lead to sustainable effects in the studied populations as generally applicable to the population at large. They should also enable institution strengthening and capacity building in a sustainable manner in the host country, and further cooperation and collaboration between institutions in developed and developing countries.

The Foundation expects research proposals to be primarily the initiative of local researchers from the developing countries. However, the Foundation will be inclined to consider favourably those applications made jointly by scientists from developed countries

with those from developing countries provided it is clear that the initiative will result in capacity building and human-resource development in the latter and that the bulk of the budget is spent in the developing country.

CURRENT POLICY

Sustainable improvement in human nutrition is one of the major issues in the portfolio of the Foundation. During more than 50 years, basic and applied research in nutrition has been supported by the Foundation in over 50 developing countries. In view of the past activities of the Foundation as well as the world's situation at the turn of the millennium, it was recognized that the public-health relevance of the supported research as well as aspects of sustainability, capacity building and educational issues should have a higher priority. Thus, priority is given to projects which lead to sustainable developments with strong elements of capacity building, and the implementation of the results of a research project should be immediate and sustainable. Highly sophisticated nutrition research of mainly academic interest without public-health relevance has lower priority for support, as do solely laboratory-based studies or animal experimentation.

RESEARCH TOPICS

At present the Foundation's work is primarily concerned with human nutrition research issues dealing with:

(1) maternal and child nutrition, including breastfeeding and complementary feeding,

(2) macro- and micronutrient deficiencies and imbalances,

(3) interactions between infection and nutrition, and

(4) nutrition education and health promotion.

The precise priorities and goals of the Foundation are modified from time to time to meet emerging public-health and nutritional needs in the developing world.

Studies in other areas of human nutrition research might also be considered, as long as they are dealing with problems of malnutrition in eligible countries (see above). Other areas of research (e.g. obesity, non-communicable diseases) may be considered for support if the applicants can offer specific and convincing evidence and justification for the choice of the research topic, especially when an innovative approach is suggested. The Foundation prefers a food-based approach suggesting local sustainable solutions which are affordable for the whole target population. Projects with a questionable sustainability or projects with commercial, product-related solutions are not supported.

Funded projects are usually of one- to three-year duration. Projects with a high potential for effective and sustainable improvement of the nutritional status as well as a high capacity-building component will be funded preferentially. The budget of the projects must be appropriate and reasonable and has to be justified in detail.

One of the Foundation's main aims is the transfer of scientific and technological knowledge to target countries. In cases where Foundation-sponsored research projects are realized in collaboration with scientists at universities and research institutes in high-income countries, at least 75% of the budget has to be earmarked for use within the low-income country.

Research grant applications from high-income countries are only considered under rare and exceptional conditions.

The Foundation does not normally fund:

(1) projects with low public health relevance

(2) projects with doubtful sustainability

(3) projects lacking transfer of scientific, technical and educational knowledge, i.e. lacking a capacity-building component

(4) nutrition surveys or surveillance studies (except when needed as a basis for a specific intervention study)

(5) research on food policy, food production and food technology, except when linked to an intervention with high potential for sustainable improvement of the nutritional status

(6) non-food-based approaches (commercial drug- or product-dependent interventions lacking sustainability)

(7) in vitro and/or animal experiments.

ELIGIBLE INSTITUTIONS

Eligible institutions are departments or institutes from universities, hospitals, and other institutions of higher education in low- or lower-middle-income countries. Joint applications from more than one institution (especially South-South) are welcomed. Joint applications from more than one institution involving a North-South collaboration may also be considered. For project applications demonstrating North-South collaboration, it is important that the following criteria are fulfilled: (i) the Principal Investigator is from the South and the proposal has relevance to nutritional problems of the South; (ii) the majority of the budget is earmarked for the South; and (iii) demonstration upon completion of the project of institution- and capacity building in a sustainable manner in the South.

The capacity-building component represents a core issue for all applications to the Foundation. This means that every application needs to demonstrate a training and human-resource and capacity-building component for the developing world. Ideally graduate students or young investigators should play a key role and, where possible, be designated as the Principal Investigator (PI), i.e. be the primary grant applicant, or Co-PI. Established researchers can nevertheless apply but need to clearly indicate the capacity-building component and the designated beneficiaries. Established investigators alone are not usually eligible to apply for a grant, except when they address innovative and exceptionally well-justified research questions in developing countries. Such applications need to clearly state the capacity- and human-resource-building components in the host country as well as the long-term sustainability of research in the host institution. Applications from individuals who are non-affiliated researchers and not attached to research or academic institutions can be considered only in very special cases.

TYPES OF AWARDS

The Nestlé Foundation offers different award and grant categories, some of them using a modular approach; for example, the Pilot Grant Program represents the starting grant module for a later Full Grant Research application. The eligibility criteria as well as the research objectives and topics have to be fulfilled no matter what the award category (for further details see www.nestlefoundation.org):

Grant type	Description	Budget (in USD)
Training Grant (TG)	The Training Grant (TG) Program supports a small research project such as a MSc or PhD thesis project or another training endeavour.	**up to 20,000 in total**
Pilot Grant (PG)	The Pilot Grant (PG) Program provides support for pilot research that has a high potential to lead to a subsequent full research project grant. Usually the Foundation does not support nutritional survey research, but often to be able to identify areas of problems for potential intervention one has to collect baseline data. If a pilot study (pre-study or baseline study) will create the needed data for a larger research project, the PG program may assist this. The pilot study and PG usually represent the starting point for a later full research grant application (i.e., a SG or LG) to the Foundation.	**up to 20,000 in total**
Small Research Grant (SG)	The Small Research Grant (SG) provides support for a small research study. This may represent a continuation of a TG or a PG.	**up to 50,000 in total**
Large Research Grant (LG)	Full grant application of a complete research proposal according to the guidelines.	**up to 100,000 per year to a maximum of 300,000 for 3 years**
Re-Entry Grants	To encourage post-graduate students to return to their own countries and to aid them in establishing their careers, the Foundation will support a research programme for eligible candidates. The host institution will need to guarantee a post for the returnee and ensure career development within the host institution. Contribution of support to the eligible candidate from the host institution is essential, while support and collaboration from the overseas institution where the candidate trained is helpful.	**up to 50,000 in total**

Institutional Support
Institutional support involves the support of research or educational projects in specific institutions in low- or lower-middle-income countries which contribute to a focused development of capacity and know-how and human-resource development in the corresponding institution.

HOW TO APPLY

Interested scientists should first submit a letter of intent in which they describe very briefly the kind of project they would like to undertake, including an estimated budget. Instructions for the letter of intent are available on the Foundation website at www.nestlefoundation.org. For a submission of a letter of intent only the downloadable form on our website should be used. If the suggested project is compatible with the Foundation's current funding policy, applicants will receive an invitation to submit a full grant proposal. The guidelines for the submission of a full grant proposal are also available on our website. Other formats will not be accepted, neither for the letter of intent nor for the full grant applications.

In the letter of intent and in the grant application, detailed, evidence-based information about the public-health relevance of the project as well as its immediate impact and sustainability have to be reported. This part of the application is as important as the scientific section of the application.

Research grant applications are evaluated twice a year by the Foundation's Council, a group of independent international scientists. The funding of projects is primarily based on the scientific quality, public-health relevance in the short and long term, sustainability, capacity-building component and, last but not least, budget considerations.

Applications are accepted throughout the year, and the Foundation encourages applicants to submit their proposals early to allow sufficient time for internal as well as external reviews. All submissions—upon invitation after the approval of a letter of intent—should be made electronically by e-mail. Final deadlines for submission are January 10 and May 10 for the Spring and Fall Council Meetings, respectively.

For more information consult www.nestlefoundation.org

The Council of the Foundation consists of at least five Council Members and Advisors. All Council Members and Advisors are internationally well-known scientists with specific expertise in different fields of nutrition. The Council is self-constituting and operates independently. The Foundation is directed jointly by the Director and the President of the Foundation.

THE COUNCIL

Petra S. Hueppi, MD
President, Nestlé Foundation
Professor of Pediatrics, Children's Hospital, Child Development Disorders, University of Geneva, Geneva, Switzerland

Benjamin Caballero, MD, PhD
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Dominique Darmaun, MD, PhD
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Nemours Children's Clinic, Division of Endocrinology, Diabetes and Metabolism, University of Florida, Jacksonville, Florida, USA

Anura Kurpad, MD, PhD
Professor & Head of Physiology, Head IAEA Collaborating Centre, St. John's Medical College, Bangalore, India

Ann Prentice, PhD
Director and Head of the Nutrition and Bone Health Group, MRC Human Nutrition Research (HNR), Elsie Widdowson Laboratory, Cambridge, UK

DIRECTOR

Paolo M. Suter, MD, MS
Professor of Medicine, Clinic and Policlinic of Internal Medicine, University Hospital, Zurich, Switzerland

SECRETARIAL OFFICES

Charlotte Terrier
Assistant to the Director

AUDITOR

Ernst & Young AG, Bern, Switzerland

From left to right: Ben Caballero, Ann Prentice, Petra S. Hueppi, Dominique Darmaun, Anura Kurpad, Paolo M. Suter

REFERENCES AND CREDITS:

Page 38-41: Figure 1: Necrotizing ulcerative gingivitis in a 3 - year old child The gingival inflammation involves the mandibular incisors. Reproduced with permission from Enwonwu CO, Phillips RS, Savage KO. Inflammatory cytokine profile and circulating cortisol levels jn malnourished children with necrotizing ulcerative gingivitis. Eur Cytokine Net 2005; 16:240. Figure 2: Schematic representation of factors involved in the development Necrotizing Ulcerative Gingivitis. Figure 3: Pro- versus anti-inflammatory cytokines in African children with acute oro-facial noma (cancrum oris). Reproduced with permission from Phillips RS, Enwonwu CO, Falkler WA. Eur Cytokine Netw 2005,16, 70. (Copyright information from the author communicated on March 26th 2021).

Profile of an Institute (Country Data):
https://data.worldbank.org/indicator/SN.ITK.SALT.ZS?locations=GH; https://www.indexmundi.com/ghana/contraceptive_prevalence_rate.html; https://www.who.int/gho/countries/gha/data/en/; https://www.cia.gov/the-world-factbook/countries/ghana/;

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PHOTO:

Page 39/40: Cyril Enwonwu, **Page 39:** Figure by Cyril Enwonwu, **Page 42 & 44:** Hanny Wijaya, **Page 43:** Lidewyde Berckmoes, **Page 50 (top) & 52:** Public Affairs Directorate of the University of Health & Allied Sciences, Ho, Volta Region, Ghana.

Cover: Family in Hawassa (Ethiopia) during Meskel- photograph by Paolo M. Suter

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Throughout The Report 2020 all gender-specific terms are to be considered to refer to both the feminine and the masculine form – except when referring to a particular person. In addition the singular denotes the plural.

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