Nestlé Foundation REPORT 2011

REPORT 2011

Nestlé Foundation
for the study of problems of nutrition in the world

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Talk doesn't cook rice.
Chinese Proverb

References and Credits:

PAGE 5 : Hui LL et al. Arch Dis Child 2008;93:561-565. PAGE 10-12: 1. Chambers R. & G. Conway. Sustainable rural livelihoods: practical concepts for the 21st century. 1992, 42 pp. University of Sussex, Institute of Development Studies. 2. Cited from FEWS NET's livelihoods framework at http://www.fews.net/pages/livelihoods-learning.aspx?l=en. 3. Asean DDR Portal. Binas R. The Great Divide Between Disaster Risk Reduction and Disaster Management. http://www.aseandrr.net/NewsEvents/. 4. http://www.unisdr.org/we/inform/terminology. 5. Ekundayo JD Thompson. Adult Education & Development, 2002, No. 59, page 97-115. 6. Ali SS et al. J Pak Med Assoc, 2005; 55:550-553. 7. Barooah, V. Maternal literacy and child malnutrition in India. MPRA Paper No. 19833. Munich Personal ReEc Archive (mpra.ub.uni-muenchen.de/). 8. Women, education and empowerment: Pathways towards autonomy, 1995. http://www.unesco.org/education/pdf/283_102.pdf. 9. Caldwell, JC (1979). Population Studies, 33: 395-413. PAGE 38: 1. Sazawal S et al. Lancet. 2007;369:927-34. 2. Tielsch JM et al. Lancet. 2007;370:1230-9. 3. Tielsch JM et al. Lancet. 2006;367:144-52. 4. Sazawal S et al. Lancet 2006;367:133-43. 5. Fawzi WW et al. AIDS. 2002;16:1935-44. 6. Benn CS et al. Int J Epidemiol. 2009;38:586-90. 7. Report of the WHO technical consultation on neonatal vitamin A supplementation research priorities. Geneva, Switzerland, 2008. PAGE 42-44: 1. Combating Micronutrient Deficiencies: Food-based Approaches. Edited by Thompson B & Amoroso L., FAO & CABI (ISBN-13: 978 1 84593 714 0), 2011, pp 432. 2. "Combating Micronutrient Deficiencies: Food-based Approaches" http://www.fao.org/docrep/013/am027e/am027e00.htm. 2. 3. http://www.fao.org/ag/humannutrition/nationalpolicies/meetings/en/. PAGE 46: 1. National Research Council (1996). Lost Crops of Africa: Grains. Washington, DC: National Academy Press. 2. Millet seed reference guide. www.egerbil.com/millet.html. 3. Robert L et al. (2002). Pearl millet a new crop option for sandy soils or other moisture-limited conditions. Jefferson Institute, Columbia. MO. 4. Davies C. Book Review: 'Proceedings: International Pearl Millet Workshop' (JR Whitcombe & SR Beckerman, Editors) Andhra Pradesh, ICRISAT (1987). Experimental Agriculture, 1989;25:563. 5. Origin and history of millet http://www.syngentafoundation.org/index.cfm?pageID=193. 6. Katie M et al. J Archaeol Sci 2010;38:312-322. 7. Arora N. Forgotten foods: are there any other gluten-free grains except rice? http://www.naturopathicliving.com/cms/forgotten-foods-are-there-any-other-gluten-free-grains-except-rice/. 8. Policy Pennings by Ray DE et al. (May 2011): "Unjustified perceptions" explain why Africa's indigenous grains are not well known. http://www.agpolicy.org/weekcol/565.html. 9. World Bank. (1996). Millet Production Growing in Africa: ICRISAT Designs Improved cropping Systems for Sahelian Millet, Cowpeas. http://books.google.co.ke. 10. Rathi A et al. Food Chem. 2005; 85:275-280. 11. Railey K. Whole Grains: Millet (Gramineae/Poaceoe) http://chetday.com/millet.html. 12. Baker RD. Millet Production Guide A-414. Cooperative Extension Service College of Agriculture and Home Economics, 2008. http://printfu.org. 13. Variano-Marston E et al Cereal Chemistry 1980;57:150-152. 14. The World's healthiest foods. http://www.whfoods.com/genpage.php?tname=foodspice&dbid=53. 15. CGIAR. Nourishing the future through scientific excellence. http://www.cgiar.org/impact/research/millet.html. PAGE 48: 1. Raiten DJ et al. Am J Clin Nutr 2011;94:633S-50S. 2. Black RE et al. Lancet 2008;371:243–60.

Photo:

Cover: Fishermen bring in their catch (Puri, India) - photograph by Paolo M. Suter

PAGE 2: Spirulina algae: H.R. Preisig, Botanical Garden & Institute of Systematic Botany, University Zürich, Switzerland. PAGE 13: Woldmapper map 195 Youth Literacy and map 197 Illiterate Young Women Reproduced with permission from Worldmapper (http://www.worldmapper.org) © Copyright 2006 SASI Group (University of Sheffield) & Mark Newman (University of Michigan); PAGE 29 TOP: Microscopic picture of sand from Puri beach (Bay of Bengal, Orissa), André Wethmar, Dept. of Pathology, University Hospital Zurich, Switzerland. PAGE 46: Syngenta Foundation, Basel, Switzerland PAGE 50: Mahidol University, Bangkok, Thailand. All other pictures © by Paolo M. Suter

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

HIGH-IMPACT – RESEARCH PROJECTS TO REDUCE MALNUTRITION

INNOVATIVE – FOR SUCCESS

CAPACITY BUILDING – AS A BASIS FOR IMPROVEMENT

SUSTAINABILITY – A KEY MISSION

ENDURABLE NUTRITION – THE PRESCRIPTION FOR SUCCESS

PUBLIC HEALTH – ORIENTATED

EVIDENCE-BASED – PROACTIVITY

THE FOUNDATION AT A GLANCE

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 Orientated

Table of Contents

President's Message

In 2011, as in former years, the Nestlé Foundation has supported many projects involving infants, children, adolescents or pregnant women. According to the goals of the Foundation, many of them focused on problems related to nutrition, mainly on malnutrition and/or its consequences, such as anaemia in adolescent girls, to name one example. In most projects, anthropometric measurements are used to follow growth by using the international growth curves for infants, children and adolescents used by those trying to reach the millennium goals of the United Nations. At a first look it seems indeed reasonable to use international standards for growth for this worldwide effort involving many nations and actors. In many countries of the world, these standards have been and will continue to be useful. But are they really appropriate in every country? For certain regions of the world, they may overestimate the growth potential of the population and it is important to remember the limits of these standards. We feel that it is important to establish local growth curves for a given population and would like to encourage scientists involved in projects supported by the Foundation to reflect on what is reasonable for the region in which the project is carried out.

What are the reasons to question the use of international growth curves? We know from the evolution of "normal" growth in the past century that in the United States and Europe the final stature of men and women has increased to a large extent: in Europe this increase reaches between 10 and 15 cm for men, for instance. In addition, during a time span of about 150 years, the age by which sexual maturation starts has decreased by several years. This indicates that growth-hormone-dependent growth has increased, but in addition that birth weight, which is determined by growth-hormone-independent growth, has increased, too. Numerous observations have shown that this trend differs greatly between rural versus urban regions and south versus north, not only in terms of the importance of the trend, but also its timing.

In some regions characterized by a western lifestyle the trend seems to slow down. Taken together, we can say that the parameters of growth, i.e. height and weight at a given age, are in motion all over the world, but at a different pace in different regions. Among the environmental factors involved, nutrition is certainly the most important one, but of course genetic determinants have to be taken into account. In many countries these observations have encouraged a regular revision and adaptation of reference growth curves.

These observations call for a cautious use of international growth curves, especially in Asian populations, for which they are not appropriate. As shown by L. L. Hui and collaborators, Hong Kong Chinese toddlers are on average shorter compared with international growth standards and the authors rightly say that inappropriate expectations concerning length or weight for age at an individual level could result in unnecessary worry and overfeeding. This has to be avoided, even more today, since overweight and obesity have become huge problems. Similarly, it is worth thinking about "normal" birth weight: although we know that low birth weight is associated with certain chronic diseases in later life, such as hypertension, cardiac diseases and type 2 diabetes, what is the "normal" birth weight, meaning a birth weight not associated with these diseases in an Asian population?

In light of these observations, it seems important that standard growth curves used in research projects on problems in nutrition and related deficiencies be established locally for a given population. With the rapid spreading of a western lifestyle in many countries, standard growth curves should also be monitored over time. Furthermore, observations on changes in birth weight and its relation to later disease in regions where the nutrition of young women rapidly changes will be similarly interesting. In the near future we will certainly learn more about genetic and epigenetic determinants of growth and the differences of these determinants in different regions of the world.

We hope that some of the projects submitted to our Foundation in forthcoming years will address these problems.

Susanne Suter

One of the Foundation's main aims is the transfer of scientific and technological knowledge 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. To further fulfil the mandate of the Council and also encourage sustainable improvement in nutrition, a proactive, strategic area of activities was introduced in 2003: **The enLINK Initiative.**

Projects Initiated by the Foundation

The enLINK Initiative

- Elucidation of the carotenoid conversion factor in spirulina
- The enLINK digital library
- The enLINK hard-copy service
- Small mobile enLINK library trunk in English & French
- The large enLINK library trunk

The enLINK Initiative

Sustainability and public-health relevance are key issues for all activities of the Foundation. Research projects need to result in a short- and long-term public-health implementation. Knowledge and know-how have to be sustainable at all levels of 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, a project 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 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 four main levels:

1. exploration in nutrition, which represents the research level
2. education in nutrition, targeting populations such as researchers, medical doctors, or health care workers, or the general population or specific population groups such as women
3. electronic nutrition
4. endurable nutrition

The elucidation of the high bioavailability of provitamin A from spirulina algae has been studied initially in a metabolic ward study as well as an intervention study. Based on these studies we know that the conversion rate of provitamin A in spirulina to vitamin A is around 4 : 1, which is much higher than in most other food items. The daily addition of small amounts of spirulina powder to food will lead to an improvement if not normalization of the vitamin A status.

The digital enLINK library is currently offering free full-text access to key nutrition journals and nearly 20 e-books. The library is accessible free of charge to registered users who all receive a password – registration is also free as long as the applicant comes from a low-income country.

Despite all the advances in information technology, books and printed materials will remain indispensable. In 2011 small and large orange enLINK library trunks were shipped to 14 institutions in 11 different low-income countries.

We cannot solve the problems that we have created with the same thinking that created them.

Albert Einstein

The enLINK circle:
Livelihood and enLINKed literacy

During the last few years the concept of "livelihood" has joined the concept of food security and nutrition security and more generally the issues around poverty reduction. Not surprisingly, the aim of a large fraction of the development aid is targeted at a sustainable livelihood for all. The classical definition of livelihood by Chambers & Convay (1) states that "a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base".

This definition and description of livelihood is in agreement with the key activities of the Foundation. During more than four decades the Nestlé Foundation has been engaged in numerous projects targeting personal and population-wide capacity: as a research foundation the Nestlé Foundation promotes nutrition research and local scientific capacity building in over 50 different countries. To enhance scientific learning, reading and designing research projects, English and French enLINK book trunks have been created which are freely offered to institutions and libraries in low-income countries. The enLINK digital library offers free full-text access to nutrition research journals and e-books for individual researchers in low-income countries (see page 14 to 17). Last but not least the Foundation last year sponsored the acquisition and shipment of more than 20,000 English books – from novels to science books – to Asmara Public Library in Eritrea. The activities of the Foundation target all strata of a population with the ultimate goal to improve livelihood for all.

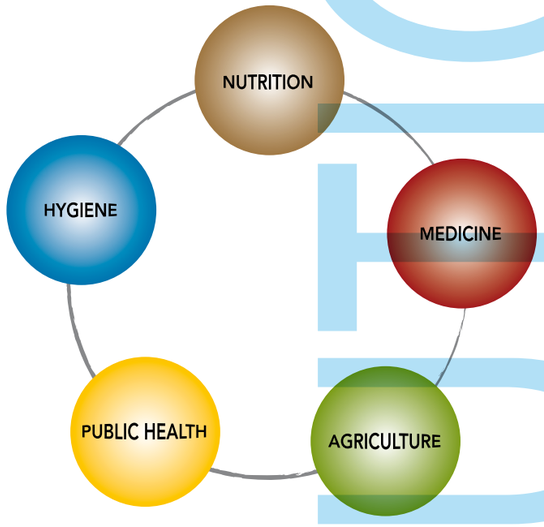


Figure 1: The enLINK circle: The five central fields of intervention for the control of malnutrition, hunger and poverty

The concept of livelihood is complex and contains many different issues and modificators, some of them modifiable, others not. Basically "livelihood" describes "means by which households obtain and maintain access to essential resources to ensure their immediate and long-term survival" (2). Non-modifiable external determinants include, for instance, the geographic location, including available infrastructure; agricultural issues from production, processing to storage; ecological aspects; sociological dynamics within a group of people or the whole society; or also land ownerships or quick changes in other vulnerability factors such as climate factors or seasonality. Single determinants of livelihood will be discussed later. To react to a threat we do need to know the major modifiable determinants of a threat. Poor livelihood should be regarded in the modern globalized world with the same critical view as any other kind of disaster. There are no good statistical data on the prevalence of an insufficient livelihood, but we know that there are at present nearly one billion hungry people in the world. It should be remembered that hunger and protein energy malnutrition are an important part of the picture. Usually these people do not only have a lack of food, but they also have no or only insufficient access to schools, basic medical care and social services; no adequate housing; no hygienic environment; no access to clean water; no whatever … you name it. Therefore basic needs are not met and the result is an inadequate or non-existent livelihood and poverty. The lack of an acceptable livelihood has to be regarded as a threat for future local and global development and is actually a global disaster. Accordingly the disaster risk reduction formula is also applicable in the context of the vulnerability for an inadequate livelihood. The disaster risk reduction (DRR) formula (3, 4) is

$$\text{Disaster Risk} = \frac{\text{Hazard (H) x Vulnerability (V)}}{\text{Capacity (C)}}$$

The central immediately applicable concept behind this equation is that the disaster risk is reduced if the hazard and/or the vulnerability of a person (population) is reduced and/or when capacity is increased. The formula defines clearly the fields of action. Obviously the modern world has to work on all three determinants in the nominator and denominator of the formula; however, capacity is central since it provides the basic knowledge for action-oriented support of the daily challenges and leads thereby to a reduced vulnerability and often modulation of external and internal hazards (e.g. poor hygiene, infection risk, inadequate food preparation habits, etc.). Capacity (or capability) is defined as "the combination of all the strengths, attributes and resources available within a community, society, or organization that can be used to achieve agreed goals" (4). The central factor behind all capacity is knowledge. By its contribution to build up local nutrition research capacity in low-income countries, the Foundation contributes to the improvement of all parameters in the disaster risk formula.

A basic starting point for building capacity is literacy. Looking at the Worldmapper map on "youth literacy" (see the map at the top of page 13) one can easily recognize that there is already a good level of literacy in certain geographic areas of the world (such as Asia) but still insufficient levels in many areas of Africa. Quite impressive, if not to say frightening is, however, the surprisingly low literacy rate for women in many areas of the world. This map (see the map on the bottom of page 13) shows the number of young women in each territory that would need to be educated to reach the same literacy rates as young men. Literacy is probably the most important single basic prerequisite and condition for an improved livelihood. In view of the key role of women in most societies the lack of literacy in women is actually an unacceptable "disaster". The relationship between women's literacy rate and overall health outcomes, family health, birth outcomes, episodes of diarrheal diseases in children, malaria infection, breastfeeding practice and habits, child and maternal mortality and malnutrition and, last but not least, school enrolment rates of children (especially also of girls) is an established fact. Further, it has been shown

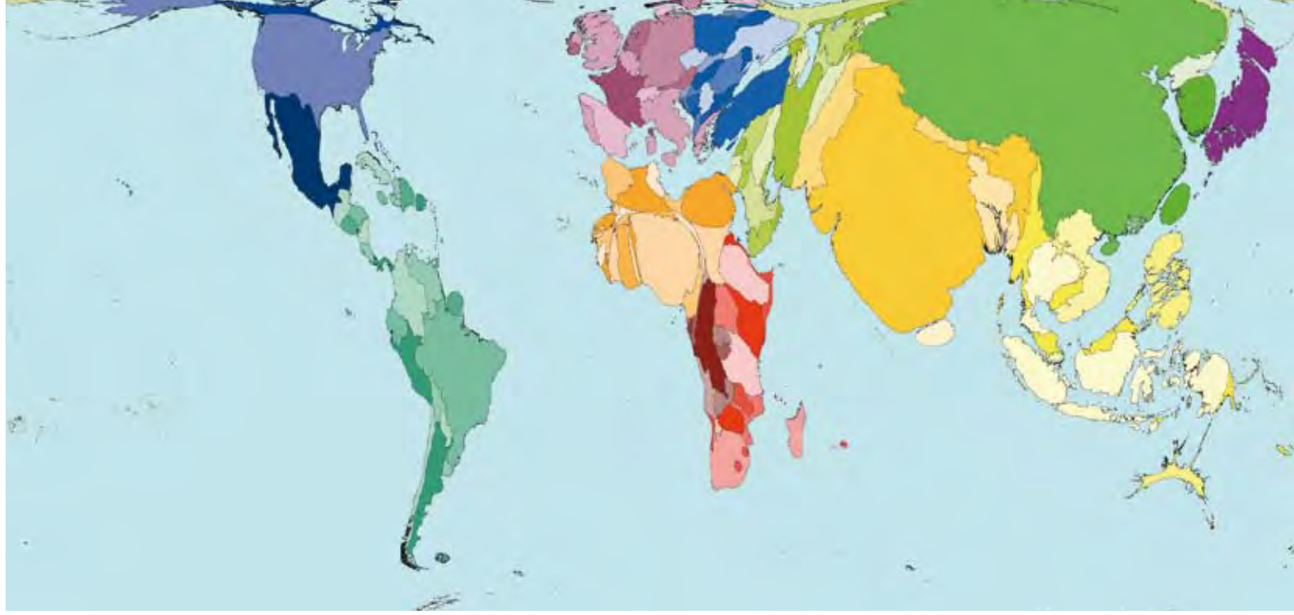
that literate women are more likely to attend health clinics. Literate women tend to have their first child at a later age, have larger birth intervals and have in general fewer children and, last but not least, children with better overall health and nutriture. In a study by J.C. Caldwell (9), for each extra year of maternal education a 9% decrease in under-five mortality was found. Obviously education and schooling is one part of a complex network of interrelated factors leading to a better livelihood. Women's education is a very central element of it. The above-cited relationships speak for themselves and the strategic impact of this know-how for future development is obvious.

Taking all the components of development support together, there is probably no strategy simpler or more effective than schooling and improving literacy in children. Literacy is basic for successful knowledge acquisition, reading skills, understanding and communication skills. It is basic for the ability to evaluate ideas, concepts and alternatives resulting in targeted action, implementation and more learning and finally an improved livelihood. It is surprising that basic education is not sufficiently implemented up to the last consequences in many countries.

Literacy of the mother has been identified as a central modifiable risk factor for malnutrition in children under 3 years (5, 6). Without literacy at all levels of the society the enLINKing of the key factors in the enLINK circle (see Figure 1) will never be achieved and the problems will persist. Many strategies of childhood and maternal mortality reduction are fortunately on a good track but there are still gaps and many insufficiencies in the implementation. There is a tremendous amount of literature showing a direct relationship between reading skills and all kinds of health outcomes. Once more the literacy as well as reading skills of women is associated with a reduced child mortality, to mention just one typical example.

Obviously there is a need to advance in research and science but in view of the major livelihood impairments in many areas of the world we should first apply present knowledge and make basic education accessible to all members of a society. We should not only do what we can based on our expertise and capacity, but we should try to favour activities which will lead to a sustainable improvement. In most cases the two latter approaches are quite different. There is no doubt that basic education starting with reading skills and (local language) literacy is central. The rest will follow. The Foundation, as outlined above, has recognised these aspects of livelihood improvement for 46 years.

The vision for reduced malnutrition, better health and livelihood starts with the reading and literacy skills of the children. The Foundation suggests "enLINKed" literacy as a path to a better livelihood for all.

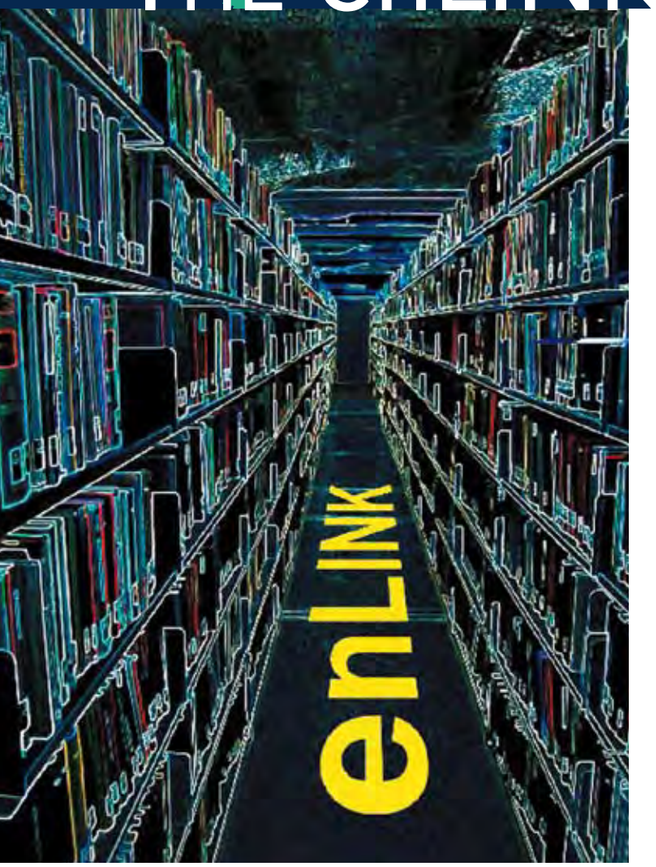


Map Legend:

Youth Literacy (above)
The territory size on the map shows the proportion of all youth between the ages of 15 and 24 who are literate. The minimal definition of literacy used here is being able to read, write and understand a short and simple statement about one's everyday life. A majority of the young people (88%) in most geographic areas can read and write; most of them live in Asia.

Illiterate Young Women (below)
The territory size on this map is proportional to the number of illiterate females aged 15 to 24 years, minus the number of illiterate males of the same age in the same territory – i.e. only territories with greater female illiteracy have an area. Thus the map reflects for each geographic area the number of young women who would need to be educated to reach the same literacy rates as young men.

The enLINK Library



e-journals in nutrition
e-books
Global Health Database

As discussed in the enLINK circle article (page 10), literacy plays an important role in education. We all know that without access to information, there is no education. Eight years ago, the Foundation constructed the enLINK digital library of nutrition research, which is now appreciated by users in over 30 low-income countries. This library is a concerted action between OVID Technologies, certain farsighted publishers, and the Foundation. As of December 2011 the following publishers or IT providers are engaged in the enLINK library, delivering functional full-text access to journals and e-books: Annual Reviews, CABI, Cambridge University Press, OVID Technologies, Wolters Kluwer Health, Inc., and Lippincott Williams & Wilkins. Other publishers will hopefully join in the future to assure information transfer in the field of nutrition research at the individual level.

There are several other information platforms (e.g. HINARI) delivering free or at least low-cost online access in the developing world. These initiatives are very much welcomed but they focus on the delivery of a high volume of information to institutions. The enLINK library tries to deliver focused content about nutrition and nutrition research to individual users. Continuous access is thus assured around the clock.

For nutrition information, the enLINK library is already an established and appreciated source of information. The enLINK library targets individual users and so far registered users from over 30 different low-income countries have access to this unique library. During 2011 access was restored after technical challenges for certain journals. In addition, starting in January 2012 users have to renew their password in regular intervals. At present 8 journals and 16 e-books are accessible in full-text mode. The user will find the needed content and information in a small number of high-quality sources. In the enLINK library there is no danger of being drowned in the information flood.

Besides full-text access to selected nutrition journals, a large e-book section is fully operational, as well as the Global Health Database.

If you are from a low-income country and if you are working in your country of origin, apply at www.enlink.org to become a registered user. (Please read the instructions carefully and follow the guidelines. ***Registration and use of the enLINK library are both free of charge***.)

enLINK statistics as of December 31, 2011:

- Over 80 users from 33 countries
- More than 19,000 page views per month
- More than 180 views per day

The orange library

The enLINK library trunks – Where there is no Internet

Who does not know the famous book *Where there is no doctor* by David Werner? This book and many others are included in the orange enLINK book trunk from the Foundation since "where there is no Internet", books are indispensable.

There is no education without access to information. In today's world, information access is equated with access to the Internet and other electronic media. Yet despite all the developments in information technology and computer science, this statement is in part a misconception. It is well known that a combined, integrated access to hybrid collections of printed and electronic resources is at present the most powerful tool for education. In addition, there are many geographic areas without access to the Internet or only at high cost. There the mobile enLINK library trunk fills the gap.

The mobile enLINK library consists of an orange metal trunk containing more than 120 books, brochures and guidelines from the field of nutrition and health. Nutrition cannot be viewed separately from other disciplines, especially medicine, agriculture or public health. Accordingly, the enLINK trunk also contains books such as Harrison's textbook of medicine and a textbook of tropical medicine. One can find "down to earth", ready-to-use guidelines for the treatment of severe malnutrition or the construction of a home garden.

The enLINK trunk has the same size and layout as the Blue Trunk Library from the World Health Organization (WHO). The enLINK trunk has been created as an addition to the WHO Blue Trunk Library and covers the major issues around the theory and practice of nutrition.

The enLINK nutrition library trunk will initially only be offered as a present free of charge (including free shipment) to selected nutrition institutes in low-income countries. Order forms for the enLINK trunk are available on the Foundation's website.

In 2011 20 trunks were shipped to 11 different countries and so far a total of 113 trunks have been shipped to more than 30 different countries.

According to the saying "Knowledge gained through the mother tongue is best" the Foundation has also created a French version of the enLINK trunk.

>30,000 pages of nutrition knowledge!

The large trunk

ENGLISH

FRENCH

Colour: orange
Height: 1.0 m
Weight: 80 kg
Number of books: 35
Number of brochures, booklets, etc: 120
Total number of pages: 30,000

The small trunk

ENGLISH

FRENCH

Colour: orange
Height: 33 cm
Weight: 30 kg
Number of books: 10
Number of brochures, booklets, etc: 40
Total number of pages: 10,000

Order forms for the enLINK
trunk are available on the Foundation's website.
www.nestlefoundation.org

Remember that the trunk is free of charge (including free shipment)
for institutions in low-income countries.

NEW IN FRENCH

Other Activities

New Research Projects

Institutional Support

Other Capacity-Building Activities

In 2011 the Council decided to fund 8 research projects.

Food Security

Iodine Deficiency

Childhood Diarrhea

Vitamin A

New Research Projects

Education

Complementary Feeding

Iron Deficiency

Food Security

Factors influencing household nutritional status in relation to increasing food prices in Sri Lanka

Mahinda L. Baddawelage & Ravi U. Sangakkara
Bernard Lehmann

Faculty of Agriculture
University of Peradeniya
Pilimathalawa
Sri Lanka

and

Agri-food & Agri-environmental Economics
Institute for Environmental Decisions
Swiss Federal Institute of Technology
Zurich, Switzerland

USD 21,990

This project will research how nutritional status and food purchase behaviour of the household reacts in the presence of changing food prices. To investigate this issue, data about the nutritional status and socio-economic variables such as household size, number of children, education level, income, age and gender will be collected to construct a database of baseline data. Relationships between socio-economic factors as well as food prices and purchases will be analysed using that data. By statistically examining the factors that are most important to household food security, the researchers will determine what the most relevant factors are that influence the nutritional status of individuals in the households. Additionally, this study will investigate how household members behave in the presence of a food price increase. From these results recommendations to governmental agencies on how to support urban populations to improve their nutritional status will be formulated, along with educational material to be provided to public health workers, schools and the public

Iodine Deficiency

Effects of maternal iodine supplementation in an area of mild iodine deficiency on infant development to 2 years: a follow-on study

K. Srinivasan
M. Zimmermann

Mother & Child Unit
St. John's Research Institute
Bangalore, India

and

Division of Human Nutrition
Wageningen University
Wageningen, The Netherlands

USD 197,834

Severe iodine deficiency during pregnancy impairs cognitive performance in the offspring. There are no long-term data on the effect of iodine supplementation in mild-to-moderately iodine-deficient pregnant women on infant development. A randomized, double-blind, placebo-controlled study (sponsored by the Foundation in 2010) among 275 pregnant women from the middle socioeconomic level in Bangalore, India was performed to determine the effects of daily supplementation of 200 µg iodine from week 14 of gestation to term on maternal and newborn thyroid function, pregnancy outcome, and birth weight. The follow-up of mothers and infants has been rather low and thus a follow-up study to test the hypothesis that maternal iodine supplementation in an area of mild-to-moderate iodine deficiency will improve child neuro-developmental outcome is planned. In this follow-up study the women and infants who have participated in the trial post-natally until 2 years will be included. All participating women and children will receive standard post-natal care during the study. Demographic, medical, nutritional, and maternal characteristics and parenting behaviour of the cohort will be measured as possible contributing factors to child developmental outcomes. Infant and maternal thyroid function will be monitored during the postpartum period. The primary endpoints will be mental development index (MDI) at 2 years.

Assessment of iodine status in pregnant women & weaning infants in the eastern region of Nepal

Nepal A.K. & Baral N.
Zimmermann M.

Department of Biochemistry
B. P. Koirala Institute of Health Sciences
Ghopa
Dharan, Nepal

&

Division of Human Nutrition
Wageningen University
Wageningen, The Netherlands

USD 20,004

Iodine deficiency presents a significant public-health problem in Nepal, with one third of its people at risk. In a nationwide iodine survey in 2007, 19.4% of school-aged children were found to be iodine deficient. Recent studies have suggested that pregnant women and weaning infants are at risk of iodine deficiency even in regions with effective iodized salt programs. Also, the South Asia region contains nearly 40% of newborns born annually unprotected from brain damage due to iodine deficiency. This study is designed to study the availability and usage of iodized salt and status of iodine deficiency indicators in pregnant women and weaning infants in Sunsari, Morang, Jhapa, Dhankuta, Tehrathum and Sankhuwasabha districts of Eastern Nepal. Pregnant women and weaning infants less than one year of age attending antenatal clinics of district hospitals from the above-mentioned districts of Eastern Nepal will be selected for the study. A total of 2,050 pregnant women and weaning infants will be enrolled for the study. Types of salt consumed in their household will be categorized, and salt iodine content will be measured and iodine status will be assessed by standard methods. This comprehensive study of iodized salt availability, usage and evaluation of iodine deficiency indicators in these two vulnerable groups will provide important data to help optimize iodine delivery to infants and pregnant women for proper development of physical and mental health and will have a significant impact on public health nutrition.

Childhood Diarrhea

Exploration of Myanmar rural caregivers' concepts on childhood diarrheal disease (6 -24 mo) and its management related to ORS use and feeding

Khaing Mar Zaw
Lindawati Wibowo

Department of Health
Ministry of Health
Rangoon, Myanmar

and

SEAMEO-TROPMED Regional Center for Community Nutrition
University of Indonesia
Jakarta, Indonesia

USD 18,421

A Behavioral Change Communication (BCC) component is an essential part of the Diarrheal Disease Control Program (DDCP) in Myanmar. Evidence suggests that the BCC components of the DDCP are often neglected. Evidence in Myanmar is suggestive that the still high childhood diarrhoea specific mortality – which mostly happens at home – is due to DDCP campaigns being inaccessible or people not knowing about them and in many cases even not understanding the message. The low utilization of oral rehydration therapy is well known and it is suggested that there is a need for "people-oriented approaches" in conveying such a program to the community. The discrepancy in the conceptualization of diarrheal-related issues (i.e. perceptions of the problem – cause – health need, and the choice of health care) between the community and the health professionals is well documented. Since malnutrition and diarrhoea coexist and synergistically interact there are plenty of opportunities for interventions. Formative research on psychosocial aspects related to caregivers' practice regarding diarrheal case management among 6- to 24-month-old children becomes fundamental for strengthening the BCC strategy for DDCP. This study will focus on exploring the community conceptual framework of diarrheal disease and its management in Myanmar. The study will combine quantitative and qualitative methods. The aim of the study is to improve community-based management of diarrhoea and to assist the Government in the formulation of effective locally adapted guidelines.

Vitamin A

Effect of hookworm elimination and Vitamin A intervention on anaemic status of preschool children in Sichuan, China

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USD 58,152

Anaemia is a widespread public-health problem associated with an increased risk of morbidity and mortality, especially in pregnant women and young children. Among the numerous factors, both nutritional (such as vitamin A) and non-nutritional (such as hookworm infection) ones contribute partially to the onset of anaemia. Elimination of hookworm infection in a population has been proved to be effective to reduce anaemia and improve iron status. Also, the link between vitamin A deficiency (VAD) and anaemia has been recognized for many years and interventions for the control of VAD have the potential to help control anaemia induced by either malnutrition or infection. The cost effectiveness problem of anaemia control is a challenge for developing countries. Therefore, the hypothesis was formulated that hookworm elimination combined with a vitamin A intervention is more effective but not more costly than hookworm elimination intervention alone in an anaemic, infection-prone population that was not considered iron deficient. A randomized, control and double-blinded cohort study to evaluate the hypothesis is planed. Preschool children from 15 nurseries in Jingtang county, Sichuan province, China will be recruited into the study with haemoglobin concentrations <110 g/l but not <80 g/l in an initial haemoglobin screening study. All eligible children will be randomly divided into three groups: Group I will receive no intervention as control group; Group II will receive 400 mg single-dose albendazole administration; and Group III will receive a 200,000 IU vitamin A capsule combined 400 mg single-dose albendazole once initially. The changes of symptoms and signs of anaemia and infection, physical fitness, appetite, weight and height and the concentrations of hemoglobin, serum ferritin, transferring receptor, retinol and hookworm load will be evaluated and measured before and at 3 and 6 months after intervention.

Education

A multi-approach intervention to empower posyandu nutrition program to combat malnutrition problem in rural areas

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USD 83,995

The Human Development Index in Indonesia is still low (rank 111 out of 182 countries). In 2007, there were 18.4% or about 5.25 million malnourished children in Indonesia; 1.54 million of them suffered from severe malnutrition. Malnutrition occurs in poor families with low levels of education. Thus malnutrition should be solved by an integrated approach. It is important to develop and implement an action-research which emphasizes a multi-intervention strategy through posyandu. Posyandu (Integrated Health and Nutrition Services) was implemented across the country many years ago. However, the quality of posyandu services needs to be improved. The goals of this study are several fold: To identify factors affecting community participation in the posyandu program; to identify land ownership and plant/animal diversity of rural communities; to identify knowledge, attitude and practise of nutrition among mothers and posyandu's cadres; to revitalize posyandu's activities through mothers' nutrition education, cadres training, and facilitating posyandu equipment; to improve community participation in the posyandu program; and to empower communities through home gardening for income generation and food availability. Several research steps should lead to a revival of the posyandu impact: The collection of baseline data on household socio-economic status, mothers' nutrition knowledge, attitude, and practice, caring practices, children's food consumption, and children's nutritional status should lead to the development of nutrition modules to educate mothers and cadres. Then ideal implementation strategies for these educational tools for mothers and cadres will be developed and applied. Further, mothers' participation in the posyandu program should be improved and finally the empowerment of household food availability through a productive agricultural package will finally lead to improved health and nutriture.

Complementary Feeding & Education

Effectiveness of nutrition package in improving growth of rural children (6-23 months): a cluster randomised trial

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USD 50,000

Stunting and micronutrient deficiencies are prevalent nutritional problems in Tanzania. Major contributing factors include inappropriate complementary feeding practices, repeated episodes of diseases, and household food insecurity. It is not known if a context-specific integrated nutrition package (counselling mothers on caring practices, training peers, food supplementation) can feasibly be delivered to and adopted in rural areas. It is hypothesised that in areas prone to seasonal food shortages, nutrition education together with food supplementation are more effective than nutrition education alone in improving child nutrition. The project will develop, implement, and evaluate the effectiveness of an integrated nutrition package for improving child care practices, dietary adequacy, and growth. A nine-month, cluster-randomised trial will be conducted in 14 rural villages. The villages will be pair-matched based on comparable population size and prevalence of stunting. One village in each pair will be randomly assigned to intervention or control group. The intervention group will receive nutrition education/counselling and optimised food blends. The control group will receive nutrition education/counselling alone. Education/counselling sessions will focus on feeding, hygiene, and health practices, targeting infants' mothers. Community-based nutrition counsellors will be trained to support mothers. Infants in the intervention group will receive two types of optimised food blends: 1) semi-solid mush containing sorghum, kidney beans, groundnuts, beef, and pumpkin; 2) soft puree made of sorghum, milk, and mango. The counsellors will deliver and monitor intake of the blends.

CHINA

Iron Status

Effect of soybean supplementation, parasite control and nutrition education on iron status of adolescent girls in rural China

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P.R. China

USD 43,300

Anaemia is a significant public-health problem for women in China, which produces an enormous public-health impact. Iron deficiency is recognized as the most common cause of anaemia. In rural China, inadequate intake of bioavailable iron and parasite infection contribute to the high prevalence of iron deficiency or anaemia. This project aims to investigate the effect of soybean supplementation, parasite control and nutrition education on iron status of adolescent girls in rural China. The study population will be allocated into two groups: one group will be supplemented with one cup of soybean sprout milk (200 mL, containing 20 g soybeans with 7.0 g protein and 2.5 mg iron) a day, 5 days a week for 6 months. Parasite prevention and nutrition education will be given to subjects and their mothers, followed by the distribution of 400 mg albendazole tablets for potential parasite infection. The other group will only be given albendazole tablets of 400 mg for parasite treatment. This project might lay the basis for a sustainable approach to control iron deficiency and anaemia in adolescent girls in rural China.

One of the major aims of the Nestlé Foundation is the transfer of sustainable capacity-building knowledge to low-income countries. During 2011 several different capacity-building activities were supported.

Institutional Support and Other Capacity-Building Activities

African Journal of Food, Agriculture, Nutrition and Development

Local dissemination of nutrition knowledge is of great importance. There are only a few nutrition journals on the African continent, one of them being the African Journal of Food, Agriculture, Nutrition and Development (AJFAND) (see also http://www.ajfand.net). The AJFAND is meant to create awareness of the multiplicity of challenges facing Africa that lead to abject poverty and destitution. The Foundation is supporting this important effort with a regular contribution for the infrastructure as well as for each issue. The journal is only available as a web-based publication. The submission of original articles and other contributions can only be encouraged.

The orange enLINK trunk library: English and French Versions

The orange enLINK trunk has been provided to 20 different nutrition institutions in more than 10 different countries in Asia and Africa (see page 16). Since the enLINK trunk contains only new books and publications, it represents a key addition to the existing libraries in different nutrition institutes. In certain institutions the enLINK trunk actually represents the foundation on which a nutrition library will be built. At present the small and the large orange enLINK trunk are offered free of charge. The small trunk is also available in French.

Formation Internationale en Nutrition et Sciences Alimentaires (FINSA)

In 2011 the FINSA course took place for the 20th time at the Department of Nutrition and Agricultural Sciences of the University of Abomey-Calavi (Benin). For many years the Foundation has supported this course in French to promote capacity building in French-speaking Africa. Besides support for the infrastructure of the course, the Foundation covered the travel cost as well as participation fee for 7 participants from Cameroon (1), Niger (1), Togo (3), Ivory Coast (1), and Senegal (1). It is crucial that nutrition courses continue to be held in French to promote research capacity in the many French-speaking countries of Africa.

Food and Nutrition Bulletin (FNB)

The Food and Nutrition Bulletin (FNB) is published quarterly by the International Nutrition Foundation (INF) for the United Nations University (UNU), in collaboration with the United Nations System Standing Committee on Nutrition (SCN) and the International Union of Nutritional Sciences (IUNS). Since 2010 the FNB is no longer printed and is only a web-based journal. The FNB is intended to make available policy analyses, state-of-the-art summaries, and original scientific articles relating to multidisciplinary efforts to alleviate the problems of hunger and malnutrition in the developing world. The Foundation supports the journal by paying for the subscription for 400 individuals in low-income countries. In addition part of the support is used for the maintenance of the internet platform.

Vision 2011

In the first contribution in this year's VISION 2012 section, Mr. Joseph Deiss, a member of the Swiss Federal Council from 1999-2006 and until fall 2011 the President elect of the 65th United Nation General Assembly (2010-2011), reminds us that there is actually enough food to feed the world and offers key areas for proactive action. Andrew Prentice reviews the unexpected and often controversial evidence of many micronutrient supplementation trials and reminds us indirectly to return to food-based approaches whenever possible. Brian Thompson underlines the view of the Food and Agricultural Organization (FAO) and presents convincing evidence to promote food-based approaches to alleviate malnutrition. Mrs. Mueni Ndiku and Joan Sabate (both grant recipients of The Foundation) remind us about the advantages of millet, one of the many forgotten and commercially displaced crops with a higher potential for nutritional and health benefits than many "modern" crops. Finally our Council Member Robert Russell takes a stand for better biomarkers for the assessment of the nutritional status. These five contributions are in good agreement with the aims and major areas of activities of the Nestlé Foundation.

Enough food for all

Feeding ten billion people: possible!

Joseph Deiss
Fribourg, Switzerland

Former President of the Swiss Confederation and Member of the Swiss Federal Council
President of the 65th session of the General Assembly of the United Nations, New York

The United Nations Population Fund (UNFPA) forecasts that by 2100, or already by 2050, there will be 10 billion people in the world. Will it be possible to feed so many people?

Today, with a world population of seven billion, hunger represents the greatest global humanitarian challenge. 850 million people – possibly as many as a billion – do not get enough food. It is the most shocking scandal of modern times. Even if there is still some hope of achieving the Millennium Development Goal (MDG) of halving extreme poverty and hunger in the world by 2015, millions of people will still be suffering from hunger. A fact that is appalling and immoral, because there is no shortage of food.

The first statement on which the World Food Programme (WFP) website opens is indeed clear: «There is enough food in the world today for everyone to have the nourishment necessary for a healthy and productive life» (WFP, FAQ 1). So it is possible to eradicate hunger in the world completely. In September 2010 at the UN summit on the Millennium Development Goals, the Heads of State and Government solemnly reaffirmed their willingness to keep to their promise. It should therefore be possible to dismiss the apocalyptic fears of overpopulation – provided we can find the right answers to the physical, environmental, economic and political issues involved in this challenge.

1. There is enough food

Yes, there is enough food. The positive answer may surprise. The reason for it is the progress in agricultural techniques, genetic selection and the institutional reforms that have accompanied the development of agriculture, in spite of the hurdles represented by protectionism and interventionism.

The increase in productivity will continue to impact agricultural production. One typical example: in fall 2011, the Ukrainian government corrected the grain harvest forecasts upwards: 55 million tonnes for 2011, whereas in 2005 production was just 37 million tonnes. That is an increase of 3 kg for each one of the seven billion individuals on the planet!

According to the International Grains Council's «Grain Market Report» of 24 November 2011, global grain production (wheat, coarse grains and rice) for 2011/2012 is estimated at more than 2.3 billion tonnes, or more than 300 kg per inhabitant of the world – approximately half of it to be used for human consumption. And that in spite of enormous differences in yields, which can vary from 1000 kg to more than 7000 kg per hectare. Of course the conditions of production are not the same everywhere. But there is no doubt that there is still enormous unfulfilled potential in terms of ramping up yields. In addition, especially in developing countries, a large proportion of agricultural production is lost because of a lack of adequate transport or storage.

Due to urbanisation and growth, the area covered by agricultural land will continue to decline. Soil is often used inappropriately and becomes depleted. But on top of that, much could be gained from a better allocation of the enormous resource represented by the 48 million km^2 of agricultural land, 38% of the dry land on earth (FAO), of which only a third is used for arable farming. These figures are staggering. According to the World Bank, between 2002 and 2009, the land used for producing grain increased by 50 million hectares, from 650 to 700 million hectares.

The potential is therefore huge and the answer to the question of quantity cannot be in doubt. Human food security has never reached today's levels. The average calorie consumption by 2015 will approach 3000 kcal per person per day, and it has not stopped going up everywhere in the world.

2. Food security is not sustainable

Is the answer to the issue of quantity sustainable? The answer is a clear "no".

While it may be possible to feed seven or ten billion people right now, because of current production technologies and consumption habits, it will not be possible in the future. Global warming further aggravates the issue of sustainability. Eradicating hunger and keeping to the MDG commitments are closely linked to the question of sustainability.

History shows us that civilisations that have reached an advanced level of sophistication collapsed due to an exorbitant use of natural resources. To feed 10 billion people sustainably we need profound reforms in technology, consumption habits, and economic and social conditions.

We have to disconnect economic development from an excessive consumption of natural resources and non-renewable energies. And we have to invent new environmentally friendly green technologies. To achieve this, we have to end subsidies for non-sustainable practices. We need «market»-type instruments such as environmental taxes, permits to pollute and subsidies to encourage less pollution. We need research, standards and smart regulations.

First of all there is the question of the environmental sustainability of agriculture itself and its working practices. It is about global warming, but also about water, land degradation and loss of biodiversity and genetic diversity. According to the World Food Programme (WFP), after war victims, the areas and populations most in need are those affected by natural disasters – hurricanes, storms, floods, drought, etc. – such as Pakistan, Cambodia, Honduras, the Philippines and Niger.

Agricultural sustainability is not limited to the health of the environment. It also involves economic profitability and social equity. We often forget that farmers are entitled to a living and a decent existence. To achieve this, restructuring will be needed. To feed 10 billion people, paradoxically, we will need fewer, not more, agricultural workers. In developing countries, a large redundant workforce will leave and migrate to the cities. The economic and social challenge will be to find jobs for them.

How do we gather strength to preserve the resources required to ensure the life and well-being of future generations?

Sustainable behaviour has a real cost. Every producer and every consumer must bear the full cost and responsibility of her actions. In the technical jargon, this is called «internalisation of externalities», or the principle of causality. If we can achieve it, non-sustainable energies will automatically be replaced by renewable ones, without their having to be subsidised.

It will be a challenge for domestic and international political reasons. The strategy of the «polluter pays» only makes sense if the whole world abides by it. This was the idea behind Kyoto and the efforts deployed in Bali, Copenhagen, Cancun, Durban and Rio. It is a question of global governance. To make the fight over poverty and its outcomes sustainable, everyone has to bear the real cost of one's behaviour – across the planet.

3. The economic issue of the market: price is the key signal

To guarantee sustainability of food security, we urgently need to remember the basic economic principle on the relationship between supply and demand. If we want to encourage farmers to produce more food, we have to give them more money. It is as simple as that. The recent rises in prices have shown the speed and breadth of the capacity of global farming to react to price signals.

Of course, higher food prices are a problem for the weakest. But it would be a mistake to try to lower prices artificially as that would again push down quantities. What we need are targeted social programmes to subsidise the poor and not the rich.

According to the most alarmist opinions (Oxfam), one of the main problems at the moment is a surge in food prices and speculation, which by 2030 could lead to a doubling in agricultural prices. The losers would be once more the vulnerable populations in developing countries and the winners the big food trading businesses.

The FAO highlights in the report on «The State of Food Insecurity in the World» the «volatility of international prices» and the «2006-2008 price shock». It rightly underlines the costly side of high prices for the weakest – consumers and small farmers. But it also admits to the advantages of this development which «opens the way to sustainable investment in agriculture». We should pay tribute to the «key message» that manages to avoid the trap of interventionism and protectionism: «A food-security strategy that relies on a combination of increased productivity in agriculture, greater policy predictability and general openness to trade will be more effective than other strategies.»

The President of the World Bank, Robert Zoellick, strikes the same note in his paper «Free markets can still feed the world» (5 January 2011): «The answer to food price volatility is not to block markets, but to use them better», taking a stand against the temptation to tax or to restrict exports in producer countries or to fix prices.

All too often we blame speculators. The economist should remember that it is first and foremost a question of supply and demand. There is no benefit to the speculator in accumulating, virtually or in reality, surplus commodities that nobody wants. Pierre Veya, the editor of a major Swiss French-language newspaper, very accurately describes this fact by saying: «Ultimately, final prices are determined by quantities produced and not by speculators» (Le Temps, 25 November 2011).

The first reaction to a rise in food prices should therefore be positive because it implies finally a chance to compensate farmers properly. If that does not work for the weakest, we have to influence markets so that rises in revenue work their way down to the bottom. But that does not mean that we no longer need social programmes for the weakest – which are always a better value than subsidising the rich.

4. The political issue of global governance

We have to recognise the common interest of all nations. In a world of sovereign states, how can coordinated action be achieved in the name of this common interest? To achieve it, the 21st century will have to establish a new world governance. In the short term, we have to find answers to global warming, which is linked to sustainability, and the liberalisation of world trade in agricultural products (the Doha Round), which is linked to the eradication of poverty.

If we take a look at the list of emergency situations by country and by region, at the top we find Somalia and the Horn of Africa, Libya, Côte d'Ivoire and Afghanistan. Therefore the food problem is not principally a question of quantity produced, nor of sustainability or price. Hunger is directly correlated to the inadequacy, or even depravity, of the political regimes in place. The problem of hunger is a question of governance. Even international aid faces the problem of delivery due to turmoil, corruption and war.

In a world where the defence of national interests is the only priority for the member states of any international organisation, it is impossible to envisage

any lasting progress. Governance in the 21st century needs states to recognise the common interest affecting the whole planet, alongside their legitimate national interests.

This applies in terms of peace, security and political governance. The stalemate over the reforms to the Security Council is evidence of this, even though a world of peace and harmony would be of clear benefit to humanity.

For centuries the economist has recognised the collective net benefit of free trade. The realisation of such an objective, at least on an economic level, might seem easier. But the world today is still too dominated by protectionism and trade barriers.

The approach to the question must therefore not be ideological, must not lay blame or even seek revenge, but must be positive and realistic. It is possible to feed 10 billion people – and to conquer poverty completely – provided we respond positively to the issues of sustainability, the markets and governance.

In itself, the question is a simple one: will humanity be capable, on all levels, of adopting behaviours that move us away from self-destruction and keep us on the path of harmony, well-being and sustainability?

The road to take is not one of confrontation, but one of economic rationality, responsible cooperation and solidarity between individuals and peoples.

*The French version of the text is available on the Foundation's website.

Unexpected outcomes

Trials and Tribulations: Interpreting Unexpected Outcomes from Micronutrient Interventions

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Good research ethics demand that we prioritise studies that will maximize the health benefits for the populations being studied; good research governance demands that we plan such studies carefully so that we extract the maximum benefit from the minimum invasiveness; and good fiscal prudence demands that we spend our scarce research funds as wisely as possible. It will be argued here that, all too often in recent years, nutritional research in low-income countries has fallen short of these aspirations. Micronutrient research has been particularly afflicted.

Micronutrients are surprisingly cheap to manufacture and, as their name implies, are only required in minute amounts. This has raised the hope that widespread micronutrient deficiencies endemic in poor populations could be overcome using a 'magic bullet' approach. Iodisation of salt, universal vitamin A supplementation to children aged 6-60 months and pre-conceptual folic acid supplementation are examples of success stories that have saved millions of lives and averted a great deal of human misery. But sadly there are many more failures than successes.

Large-scale intervention trials in Africa and Asia have shown that iron and zinc do not have the benefits for survival rates that were anticipated, and revealed that iron may elevate mortality in malarious areas. Vitamin A supplementation of mothers has yielded some adverse effects in terms of maternal-to-child transmission of HIV. It has been suggested that vitamin A supplements may have a malign interaction with DTP vaccines especially in girls and there is ongoing controversy over neo-natal vitamin A supplementation. And there are legions of well-intentioned micronutrient trials that have yielded null results in terms of impact. This issue is not confined to developing countries. In affluent settings epidemiological studies have frequently suggested associations between micronutrient status and outcomes such as cancers, heart disease and pre-eclampsia, but subsequent intervention trials have almost universally failed.

Why is this the case, and how can we remedy it? We should learn from this history and take a fresh approach. Investing tens of millions of dollars in further large-scale empirical trials based upon foundations of sand is almost certainly not a cost-effective way forward. We need to dig deeper and put in place the strong foundation stones of knowledge about mechanisms of action on which to build our future interventions. It is clear that despite decades of nutritional research our understanding of the very complex interactions between diet and disease is still not fit-for-purpose when trying to design micronutrient interventions.

Let us take some examples. In the case of vitamin A we have a very poor understanding of the mortal diseases against which supplementation protects and no idea of the mechanism. Vitamin A can be strongly immunomodulatory and the nature of these effects seem to depend on the age and sex of the recipient, the dose in which it is given (less may be preferable) and whether or not it is combined with certain vaccines. Smaller scale mechanistic studies performed in great detail will help to clarify these associations, and help to extend and refine what is already a life-saving intervention.

Iron is another example of where we are currently looking through a glass darkly. Iron deficiency is widespread and has multiple consequences, but iron is at the centre of a host-pathogen battle for nutritional resource and there are numerous circumstances in which there is evidence that administration of supplemental iron may enhance susceptibility to diseases including malaria, TB, HIV and bacteraemias.

The acute phase response to infection depletes circulating iron very rapidly to starve bacteria in the bloodstream of this essential growth factor and hence buy time for other arms of the immune system to fight the threat of infection. Within the past decade basic science research has uncovered the mechanisms of this effect: hepcidin – the master regulator of iron metabolism – blocks ferroportin in enterocytes (thus stopping any iron absorption) and in macrophages (thus locking iron within them). Within the past year solid evidence has emerged to show how this system can protect against malarial super-infections. These new discoveries, and similar 'discovery science' findings for other nutrients, are opening new windows through which we can understand the mechanisms linking diet and disease.

These advances make a strong case for greater investment in mechanistic research that will ultimately shine a brighter light on intervenable nutritional pathways. At the dawn of powerful new technologies such as high-throughput 'omic' methods, and advanced bio-informatics that can re-interrogate old questions, there has never been a better time for such investment.

The arguments presented above formed the central thesis of the EV McCollum International Lectures presented at the African Nutritional Epidemiology Congress 2010 (Nairobi) and at Experimental Biology 2011 (Washington DC).

Food-based approaches

Food-based Approaches to Improve Nutrition

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The Food and Agriculture Organization (FAO), a specialized UN agency, is mandated to raise levels of nutrition and ensure humanity's freedom from hunger by promoting sustainable agricultural and rural development. Focusing on the unique relationship between agriculture, food and nutrition, FAO works to protect, promote and improve established food-based systems as the sustainable solution to ensure food and nutrition security.

Malnutrition in all its forms is among the most widespread and pernicious causes of human suffering throughout the world. Malnutrition acts as a brake on economic growth and social progress with far-reaching consequences for both individual welfare and community and national development. FAO estimates a total of 925 million people were undernourished in 2010. Progress in overcoming food insecurity and malnutrition remains unacceptably slow. The combined effects of prolonged underinvestment in nutrition, food and agriculture, the recent food price crisis and the economic downturn have increased hunger and poverty, thereby jeopardizing the progress achieved so far in meeting the MDGs.

One reason for this is that nutrition is everyone's business but no-one's responsibility. Approaches include expanding the amount and diversity of food supplies; raising GDP or household incomes; making time and labour savings, especially for women; supplementation, fortification, water, sanitation and public health interventions; education and population control. Each of these can be important, but not equally so in every circumstance. Effective policies and programmes to improve nutrition must be based on a clear understanding of the relevant factors that affect the ability of households to acquire and utilize the food they need to be healthy and productive.

Unfortunately, ineffectual and unsustainable interventions are all too common in many low-income countries struggling to cope with problems of widespread malnutrition. The result is that issues related to poverty, food supplies, food security, agriculture, economic development, social protection and justice, environmental conditions and the inability of households to meet their members' needs are often neglected in favour of short-term, quick-fix interventions that push out more sustainable, longer-term community-focused food-based strategies.

Combating Micronutrient Deficiencies

Two billion people – about a third of the world's population – are deficient in one or more micronutrients. This is one of the most serious impediments to socio-economic development, contributing to the vicious cycle of malnutrition, underdevelopment and poverty. Food-based approaches (food production, dietary diversification and food biofortification) are a viable, cost-effective and sustainable, long-term solution for controlling and overcoming micronutrient malnutrition and the recent FAO/CABI publication contains success stories and lessons learned that demonstrate this.

Symposium on Food and Nutrition Security

At the FAO "International Symposium on Food and Nutrition Security: food-based approaches for improving diets and raising levels of nutrition" (December, 2010) evidence for the effectiveness of nutrition-sensitive, food-based approaches was presented as well as the benefits of incorporating nutrition objectives into agriculture, food security, economic and other development policies and programmes. The Symposium, part of the preparatory activities leading up to the second joint FAO/WHO International Conference on Nutrition (ICN+21) in Rome in 2013, called for an international movement committed to the implementation of effective, sustainable and long-term nutrition-sensitive, food-based solutions to end hunger and malnutrition. The late Michael Latham in a keynote address reasserted that social and economic inequity were the basis for widespread hunger and malnutrition and underscored the fundamental importance of addressing nutritional problems through interdisciplinary community-focused food-based approaches. In a second keynote address, Per Pinstrup-Andersen called for better intersector collaboration among those working to improve health and nutrition and those working with food systems.

Lessons Learned

- Many poor households rely on agriculture for their livelihoods. Poor households are most vulnerable to undernutrition and tend to have poor, monotonous diets.

- Hitherto the main approaches to ameliorating micronutrient deficiencies were supplements, but the disappointing results with single micronutrient supplements and the low feasibility and sustainability of supplementation as a mode of delivery in poor resource settings has led to increased emphasis on agriculture and food-based approaches.

- Pathways through which agricultural interventions may impact nutrition include direct consumption, increases in income, reductions in prices, shifts in consumer preferences, shifts in control of resources and improvements in nutrient content.

- Agriculture and agricultural biotechnology including biofortification (conventional plant breeding or genetic modification) offer the opportunity of increasing crop yields and of improving the nutrient content of staple foods and cereal crops.

- An FAO project using food-based approaches targeted at resource-poor, HIV- and drought-affected communities carried out interventions in food and nutrition security, health, education and social welfare including institution building, human resource development, participatory approaches, bio-intensive methods of agriculture, and crop and diet diversification. Communities produced more food and had greater access to a wider variety of micronutrient-rich foods,

including animal-source foods, all year round. Nutrition education and improved techniques in food production, processing, preservation and storage and preparation improved dietary quality.

- Food-based approaches, particularly utilizing animal-source foods, affects micronutrient nutrition, growth, cognitive function and physical activity, initiative and leadership behaviours, and offers potentially sustainable solutions to multiple deficiencies.

- Certain fruits and vegetables can be a good source of vitamins and minerals. Home gardening combined with nutrition education was found to be a long-term strategy for combating vitamin A and other nutritional deficiencies.

- Successful strategies include those that enhance the energy and nutrient density of cereal-based diets; increase the production and consumption of micronutrient-dense foods (especially animal-source foods); incorporate enhancers of micronutrient absorption; and reduce the phytate content of cereals and legumes through germination, fermentation and/or soaking.

- Effective nutrition education, integrating well designed behaviour-change communications and careful consideration of gender dimensions are all important.

- Improved techniques in food processing, preservation and preparation increase consumption of micronutrient-rich foods.

Conclusions and Recommendations

The multiple social, economic and health benefits associated with successful food-based approaches that lead to year-round availability, access and consumption of nutritionally adequate amounts and varieties of foods are clear. The nutritional well-being and health of individuals is promoted, incomes and livelihoods supported, and community and national wealth created and protected. However, progress in adopting food-based strategies to achieve sustainable improvements in micronutrient status has been slow and urgently needs to be speeded up. We therefore need to support an international movement for nutrition-sensitive agriculture and food-based solutions, thus allowing the world population to achieve its full human and socio-economic potential.

The Forgotten Crop

Pearl Millet: The Forgotten Crop

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and

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Ancient Grain

Most of the staple crops grown today were domesticated and brought under cultivation thousands of years ago. Pearl millet (Pennisetum glaucum), the most widely grown type of millet, was domesticated 4,000 years ago from a wild grass of the southern Sahara [1, 2, 3, 4]. Soon after, it was widely distributed across the semi-arid tropics of Africa and Asia [4]. Through trading with Eritrea and Somalia circa 3000 BC, the early Egyptians learned from the Africans how to cultivate millet, which grew well in the dry Sahara where wheat and barley were unable to thrive [5]. Recent archaeobotanical research has confirmed the presence of domesticated pearl millet in the Sahel zone of northern Mali from between 2500 and 2000 BC [6].

Lost Crop

Until about 50 years ago, pearl millet was of almost immeasurable value to millions of rural people in Eastern and Southern Africa. However, over the decades more and more farmers, especially in the aforementioned region, have abandoned it and switched to maize [1, 7]. Pearl millet must now be considered a "lost crop" in most parts of Africa.

Several reasons exist for this unfortunate agricultural shift. Firstly, international research and development efforts have made maize more productive than pearl millet; secondly, government incentives have given maize an added financial advantage; and thirdly, easier processing has made maize more convenient to use. If "lost" grains like pearl millet had received the level of research that has gone into wheat, maize and Asian rice over the last 50-70 years, they might have been competitive under the best of conditions as well [8]. The momentum for change has now gone so far that maize is often pushed into pearl millet areas to which it is poorly suited and where it cannot perform reliably [1].

New Era

However, a new era may be dawning. Pearl millet is supremely adapted to heat and aridity [9] and as the world gets hotter and drier; it may be prudent to encourage the reintroduction of pearl millet to these areas. Of all the major cereals, it is the one most able to tolerate the extremes of heat and drought [1, 2]. Primarily a tropical plant, pearl millet is often referred to as the "camel" because of its exceptional ability to tolerate drought. Pearl millet yields reliably in regions that are too hot and too dry to consistently support good yields of other grains such as maize and sorghum [9, 10]. It is less vulnerable to pests; hence, it can be grown without the use of expensive pesticides [10, 11]. Its successful production is due almost entirely to its short growing season. While millet hay crops mature in 65-70 days, grain varieties mature in 75-90 days. Millet can also be planted when it is too late to plant other crops [12].

Nutritional Efficacy

Millet is more than just an interesting alternative to the more common grains. Pearl millet is a very nutritious grain. It contains at least nine percent protein and a good balance of amino acids, more oils than maize, and it is a high-energy cereal [1, 10, 13]. Generally, its performance is comparable to maize, but in certain situations it shows a distinct advantage [2]. Pearl millet is a good source of some very important nutrients, including manganese, phosphorus, and magnesium [14]. It contains a myriad of beneficial nutrients such as B-complex vitamins including niacin, thiamin, and riboflavin, the essential amino acid methionine, lecithin, and some vitamin E. The seeds are also rich in phytochemicals [11, 7].

Millet is tasty, with a mildly sweet, nut-like flavor. It is not an acid-forming food, making it soothing and easy to digest [11]. This quality makes it a very significant weaning food for children. And it may contribute to longevity; the Hunzas, who live in a remote area of the Himalayan foothills and are known for their excellent health and long life, enjoy millet as a staple in their diet [11]. Pearl millet's economic value is immense. Millet straw is a valuable livestock feed, building material, and cooking fuel [15].

Research Efforts

It is noteworthy that despite the grain being an ancient food, research on millet and its food value is in its infancy and its potential vastly untapped [11]. With this understanding, a pilot study – supported by the Nestlé Foundation – has recently been conducted to assess the acceptability of reintroducing pearl millet grain at macro- and micro-levels in rural Eastern Kenya. Fifty years have elapsed since millet was used in most parts of the Ukambani region. This study hypothesized that with appropriate training, mothers would incorporate pearl millet into the daily diets of the children; consequently, households and villages will accept this change. A total of 40 mothers who had children below five years were enrolled in a training program in January, 2011. After training, 93% of the mothers readily gained the skill to prepare and incorporate pearl millet into the daily diet of children. Mothers were then given pearl millet to incorporate in their children's daily diet. Data from food frequency questionnaires (FFQ) revealed that children liked pearl millet at the first taste with a low of 78% and a high of 93%. Upon training 40 mothers, 97 households in Mbooni West District, Ukambani region of Eastern rural Kenya chose to plant the grain this season, an indication that households and villages accepted the reintroduction of this important grain.

Africa has more native grains than any other continent and this may be a solution to the food security issues that have troubled Africa for many years [1]. Agriculture is usually a country's biggest consumer of water. Crops like pearl millet that sip rather than gulp moisture are positioned to become a vital resource. Meanwhile, we propose to conduct a clinical trial to test the superiority of pearl millet grain compared to maize in improving the nutritional profile of children under five years and their mothers in the Ukambani region of Eastern rural Kenya.

New biomarkers

The Need for a Coordinated Micronutrient Biomarker Database

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US National Institutes of Health
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Micronutrient deficiencies are known to affect ~ 2 billion people worldwide. In addition to the specific micronutrient deficiency diseases, micronutrients play important roles in infectious disease prevention, chronic disease prevention and in neuro- and cognitive development. Reliable and valid biologic or biologically determined measures of micronutrient exposure, status, and function (i.e. micronutrient biomarkers) are needed. An example of a functional biomarker is dark adaptation testing for vitamin deficiency. Although currently we have many biomarkers in use, there is little or no global agreement or harmonization as to which biomarkers are best suited for a given purpose (e.g. for clinical evaluation of a patient vs. for program development vs. for policy development vs. for mechanistic research). In fact, chaos and confusion reign in this field, which is inimical for the accurate assessment of the impact of micronutrient nutrition on health promotion and disease prevention.

Several recent initiatives have recently been undertaken to harmonize the application and use of micronutrient biomarkers around the world. The BOND initiative (Biomarkers for Nutritional Development) was started by the National Institutes of Health in the United States (under the Eunice Shriver National Institute of Child Health and Human Development). BOND is now receiving funding from the Bill and Melinda Gates Foundation, PepsiCo and several additional institutes and offices at NIH.

The BOND program began with a workshop in 2010 with participants who represented a variety of global stakeholders: governments, non-governmental organizations, foundations, academia, and private industry. The workshop was hosted by the International Atomic Energy Agency in Vienna, the executive summary of which has been published in the American Journal of Clinical Nutrition (1). The stated goal of BOND is to provide support to the entire nutrition community by providing reliable and up-to-date micronutrient biomarker data as well as guidance as to the best biomarker for use in a given situation.

Six nutrient-specific panels of experts (for Vitamin A, Iron, Zinc, Folate, Vitamin B12, and Iodine) have been constituted to work on the development of a web-based biomarker information system and template. It is envisioned that the BOND website will be interactive (a query-based system) and user-friendly, through which the user will be able to access links to relevant resources and electronically available literature on micronutrient biomarkers (backed up by the library of the National Institutes of Health). There will be opportunities for user input, and specific advice will be provided about the most appropriate biomarker to use for a given situation and context. Data on the micronutrient biomarkers will include frequency of use, most frequent purpose of use (e.g. intervention evaluation), amount of sample needed, handling and storage of sample, assay methodology, supplies and equipment needed, strengths of the biomarker, limitations of the biomarker, factors explaining inter-individual variation (e.g. sex, age, BMI), relative expense and interpretation. It should be pointed out that BOND also will include data on biomarkers of micronutrient excess, which is an increasing problem in many developed countries due to the plethora of fortified food products on the market as well as the common practice of taking multiple and sometimes interacting dietary supplements.

The user of the BOND site will have provided information as to who the user is and what he/she is trying to do (e.g. perform a cross-sectional study), where the work will take place and the resources that are available. Thus, the best guidance as to which biomarker to use will be provided to the user for his/her context and purpose. Ultimately the information and advice provided by the BOND and the query-based system will be vetted not only by the expert panels but also by members of the BOND steering committee to ensure community acceptance and consistency with existing guidance, for example existing and emerging guidance from such authoritative agencies as the World Health Organization. This will ensure harmony within and among the stakeholder community.

Other coordinated efforts on micronutrient biomarker harmonization include the European Micronutrients Recommendations Aligned (EUREKA; www.eureka.org/folders/3772/) and the Micronutrients Genome Project (MGP; www.nugo.org/micronutrients/35099/7/0/30). EUREKA is trying to standardize the methodologies used in setting micronutrient recommendations by performing systematic reviews and soliciting expert opinion. For 20 micronutrients EUREKA has developed data on the available micronutrient biomarkers of dietary exposure and status, with the advantages and disadvantages for each. The MGP is a genetic-bioinformatics website, which was created to promote a deeper understanding of the relationship of micronutrient nutrition to health. The site contains a database of genetic polymorphisms that influence micronutrient metabolism and/or function. For each micronutrient all relevant information will be provided on the genes involved, as well as (eventually) the broader "omic" profile that is affected: proteomic, transcriptomic and metabolomic (i.e. measurement of a complete set of metabolites in tissue or body fluids).

BOND, EUREKA and the MGP are not isolated efforts. Rather, the three projects are working together to be cooperative, complementary and non-duplicative. In light of their common goals, BOND, EUREKA and the MGP are in a partnership that has allowed a close interaction and dovetailing of the respective missions. This interaction has been actualized by participation of technically relevant experts from both EUREKA and MGP on each BOND expert panel. This close interaction not only adds value to the deliberations of each expert panel but also further enhances harmonization and the development of a focused research agenda that includes cutting-edge approaches to nutrient biology and biomarker discovery. Undoubtedly, research gaps and opportunities will emerge, which will energize the development of new and perhaps more sensitive and targeted biomarkers of micronutrient status and exposure. This is what the Lancet series (2) on maternal and child health and undernutrition strongly called for. Everyone working on these new micronutrient biomarker databases should be congratulated!

PROFILE OF A NUTRITION INSTITUTE

Profile of a Nutrition Institute

Institute of Nutrition, Mahidol University (INMU)

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THAILAND

www.inmu.mahidol.ac.th

The Thai Government established the Institute of Nutrition, Mahidol University (INMU) in 1977 as the research and training arm to strengthen the National Food and Nutrition Plan. Since then, INMU has played a significant role in solving major national nutritional challenges, in promoting national food and nutrition policy-making, and in expanding important initiatives to other countries.

As times have changed, INMU's direction has shifted from investigating specific food and nutrition challenges to the improvement of food and nutrition throughout the life cycle. The Institute embraces a multidisciplinary approach in research, education and technical services. Its internationally distinguished faculty comprises a closely-knit group of food, nutrition and health professionals. Currently, INMU is comprised of 32 faculty members, 25 researchers and 118 support staff.

Research

INMU conducts research to address changing national food and nutrition challenges, and to transfer results to international organizations to address the challenges of other countries. The Institute's first research decade centered on resolving severe malnutrition among rural mothers and children. As the nation evolved from an agricultural-based economy into an urban, industrial, export-driven one, INMU's research focused on controlling and preventing over-nutrition among children and adults, along with micronutrient deficiencies. Emphasis was placed on areas like food security, food safety, food-based dietary guidelines, nutrition labeling and linking food to nutrition and good health.

The Institute's next research decade emphasized a multidisciplinary "human" development approach

THAILAND

AREA

Total	513,120 km2
Arable land	251,273 km2

POPULATION

Total	66,720,153 (2011)
Urban population	34%
Under age 15	19.9%
Median age	34.2 years

POPULATION GROWTH RATE

Total	0.566% (2011 est.)
Rural areas	-0.133%
Urban areas	1.8%
Total Fertility rate	1.8 children born/woman (2009)

GNP (per capita)

$9,700 (2011 est.)

LIFE EXPECTANCY AT BIRTH

Total	73.6 years
Male	71.2 years
Female	76.1 years

UNDERNOURISHED PEOPLE

Women with low BMI (<18.5)	9.09%

MORTALITY RATES

Birth attended by skilled health personnel	93-100% (2009)
Neonatal Mortality Rate	8/1000
Infant Mortality Rate (under 1)	12/1000
Under-five Mortality Rate	14/1000
Under-5 mortality rate (2009), Rank	125
Maternal Mortality Ratio	48/100,000 live birth
Life expectancy at birth	69 years

UNDERWEIGHT

Low birth weight	9% (2005-2009)
Underweight prevalence in children under five (%) 2003-2009, Poorest 20%	11
Underweight prevalence in children under five (%) 2003-2009, Richest 20%	3
Children under 5 underweight, moderate & severe	7%
Children under 5 severely underweight	1%

INFANT AND YOUNG CHILD FEEDING

Exclusive breastfeeding rate (0-6 months)	5%
Timely complimentary feeding rate (6-9 months)	43%
Children who are still breastfeeding (20-23 months)	19%

KEY NUTRITIONAL ANTHROPOMETRY

Stunting in children under 5	16% (2003-09)
Prevalence of wasting (moderate and severe)	5% (2003-09)

MICRONUTRIENT DEFICIENCIES

Percentage of households consuming iodized salt	47%

OTHER PARAMETERS

Total adult literacy rate	94%
Primary school net enrolment/attendance	98%
% of population using improved sanitation facilities 2008, total	89%
% of population using improved sanitation facilities, 2008, urban	95%
% of population using improved sanitation facilities, 2008, rural	96%
% of population using improved drinking-water sources 2008, total	100%
Immunization 2009, 1-year-old children immunized against: Measles	98%
Immunization 2009, 1-year-old children immunized against: Polio	99%
Immunization 2009, 1-year-old children immunized against: DPT	99%
Antenatal care coverage (%), at least once	98%
Delivery care coverage (%), skilled attendant at birth	97%

to promote “health for all”, including supporting the National Nutrition and Food Consumption Surveys; developing appropriate nutrition assessment methods; developing nutrient-rich rice strains; conducting comprehensive research on Thai foods; employing communication strategies to improve food eating habits of children and teenagers; and developing a national proactive food and nutrition network to promote the nutritional status of infants and children.

INMU’s current research involves continuing many studies from previous decades to create new knowledge and to promote sustainability, including responding to Thailand’s aging population. The Institute also cooperates with government and private sectors to undertake research studies on food and nutrition security, paying special attention to food quality, nutritive values, food safety and food, nutrition and dietetic education.

Graduate Education

INMU provides comprehensive national and international graduate education programs for governments, international development agencies, international non-government organizations and private enterprises. The degrees offered at the Institute include the Master of Science Program in Food Science for Nutrition (international program), the Master of Science Program in Nutrition and Dietetics (international program), the Master of Science Program in Food and Nutrition Toxicology (Thai program), and the Master of Science Program and Doctoral of Science Program in Nutrition (Thai program).

Technical Services

INMU provides food analytical services for public and private agencies according to the National Food Act, including the analysis of food samples for registration. INMU is also the first agency in Thailand to offer analytical services and full nutrition labeling for the USA and Thailand. Current services cover areas such as nutritional values, nutrition labeling, physical properties, additives and chemical contaminants, microbial quality, and biochemical assessment.

INMU provides national and international food and nutrition training services through short-course training programs or attachment programs, usually requested by governments and international organizations. Programs last from one week to four months and include areas like food quality monitoring, food safety and its technologies, public health nutrition, food habit research, dietary assessment and data analysis, chemical analysis of food, and nutrition communication.

INMU offers counseling services on food and nutrition including the development of nutrition in food products, a food quality guarantee system, sensory quality of food products, and nutrition labeling. These services are valuable for developing new products and for the production process, for the production of nutrition labels and nutrition information, and for identifying solutions to technical problems and conducting reliable analyses.

INMU offers research services for developing food and nutrition products and production processes. These services range from the laboratory level to the prototype factory level in order to develop safe, acceptable and highly nutritious products for consumers. INMU also has developed reference materials to control the quality of laboratory nutrition analysis.

INMU also provides information services to share knowledge about food and nutrition with the general public through the mass media and the Internet. This information-sharing service increases understanding of food and nutrition and promotes a better quality of life for people.

INMU founded a Center for Innovation and Reference on Food for Nutrition in 2011 to serve as a food reference agency for public and private sectors. Areas of focus include functional food product development, commercialization of the food product developed, health claim validation, process design, technology transfer, and technical and advisory services toward food safety for SMEs, along with other food- and nutrition-related research for social benefits.

International Collaboration

INMU is a FAO Center of Excellence and a WHO Collaborating Center. INMU serves as a training center for international organizations, such as Capacity Strengthening in Nutrition in Asia (CASNA), the International Atomic Energy Agency, The World Bank, and UNICEF. INMU has fostered strong working relationships with many prestigious academic institutions and agencies, most notably Johns Hopkins University, Ohio State University, University of Toronto and St. Michael’s Hospital, Kyoto University, Kobegakuin University, Swiss Federal Institute of Technology, University of Otago, the ASEAN Network of Food Data System, the Asia Pacific Food Analysis Network, Tufts University, and Wageningen University.

Ongoing Projects

	TITLE	PRINCIPAL INVESTIGATOR
1	2001 / Effect of vitamin A and B2 supplementation added to iron on anaemia of pregnant women in China	Aiguo Ma Qingdao University Medical College, Institute of Human Nutrition, Qingdao, China
2	2002 / Effects of an additional meal fortified with multiple micronutrients on the nutritional and micronutritional status of Vietnamese children	Nguyen Quang Dung National Institute of Nutrition, Basic Nutrition Department, Hanoi, Vietnam
3	2003 / Evaluation of valid biomarkers to distinguish between iron deficiency anaemia and anaemia of inflammation in areas of high rates of parasite infestation and nutritional deficiencies	Mohamed Ag Ayoya Cornell University, Division of Nutritional Sciences, Ithaca, New York, USA
4	2003 / Usefulness of ferrous fumarate and ferric pyrophosphate as food fortificants for infants and young children in developing countries	Shafiqul Sarker ICDDR,B, Centre for Health and Population Research, Dhaka, Bangladesh
5	2003 / Zinc homeostasis in and zinc requirements of young Chinese children	Xiaoyang Sheng Shanghai Jiao Tong University, Department of Child and Adolescence Healthcare, Shanghai, China
6	2004 / Effect of iron fortification of nursery complementary food on iron status of infants	Kim Su Huan Institute of Child Nutrition, Pyongyang, Korea, Democratic Republic
7	2004 / Investigation of blood, hair lead and manganese levels in children with different degrees of iron deficiency in Karachi	Mohammad Ataur Rahman University of Karachi, Karachi Institute of Biotechnology and Genetic Engineering (KIBGE), Karachi, Pakistan
8	2004 / Vitamin A value of spirulina carotenoids in humans	Guangwen Tang Tufts University, Human Nutrition Research Center on Aging, Boston, Massachusetts, USA
9	2004 / Study on the causes of anaemia in elderly women in China	Jian Zhang National Institute of Nutrition and Food Safety, Department of Elderly Nutrition, Beijing, China
10	2005 / Environmental supplementation of iodine by iodination of irrigation water in the Ferghana Valley	Maksuda Abidjanova Association of Endocrinologists, Kokand City, Uzbekistan
11	2005 / Stability and efficacy of vitamin-A-fortified cooking oil on nutritional status of Vietnamese children aged 36-60 months	Cao Thi Thu Huong National Institute of Nutrition, Department of Micronutrient Research & Application, Hanoi, Vietnam
12	2006 / Vitamin-A status of households according to the seasonal availability of vitamin A and beta-carotene rich foods	Romain A.M. Dossa University of Abomey-Calavi, Department of Food Sciences and Nutrition, Cotonou, Benin
13	2006 / Effect of psychosocial stimulation on development of iron-deficient anaemic infants: a randomized controlled trial	Jena D. Hamadani ICDDR,B, Centre for Health and Population Research, Dhaka, Bangladesh
14	2006 / Assessment of iron status of children in rural communities in Abia State, Nigeria	Ignatius Onimawo Ambrose Alli University, Biochemistry Department, Ekpoma, Nigeria
15	2006 / Efficacy of multiple micronutrients supplementation on anaemia in 6-23-month-old rural Burkinabe children	Hermann Ouedraogo Inst. de Recherche en Sciences de la Santé, Ouagadougou, Burkina-Faso
16	2007 / Iodine supplementation in mild-to-moderately iodine-deficient, pregnant women: Effects on pregnancy outcome and infant development	Sumitra Muthayya St John's National Academy of Health Sciences, Institute of Population Health & Clinical Research, Bangalore, India
17	2008 / Improving micronutrient status of Chinese children using dietary spirulina	Shi-an Yin National Institute of Nutrition & Food Safety, Beijing, China
18	2008 / Effects of vitamin A supplementation during lactation on infants' antibody response to hepatitis B vaccine in China	Zhxiu Wang Nanjing Medical University, School of Public Health, Nanjing, China
19	2008 / Impact of vitamin A and zinc supplementation on pathogen-specific diarrheal disease in Mexican children	Kurt Long University of Queensland, Division of International & Indigenous Health, Brisbane, Australia
20	2009 / Effect of maternal zinc supplementation during pregnancy and lactation on infants' immunity	Mohammad Bakhtiar Hossain ICDDR, B, Clinical Research Division, Mohakhali-Dhaka, Bangladesh

TITLE

PRINCIPAL INVESTIGATOR

MICRONUTRIENTS

21 2009 / Efficacy of orange-fleshed sweet potato in enhancing breast milk retinol and Vitamin A status in pregnant Kenyan women (resubmission)

Hugo Melgar-Quinonez
Ohio State University, Department of Human Nutrition, Columbus, Ohio, USA

22 2011 / Effect of soybean supplementation, parasite control and nutrition education on iron status of adolescent girls in rural China

Lei Li
Medical College of Xiamen University, Siming District, Xiamen, China

BREASTFEEDING

23 2003 / Evaluation of two counseling strategies to improve exclusive breastfeeding rates among HIV-negative mothers in Kibera slum of Nairobi, Kenya: a randomized clinical trial

Sophie Ochola
Kenyatta University, Department of Nutrition, Nairobi, Kenya

24 2008 / Information and education to support and promote exclusive breastfeeding

Ada C Uwaegbute
Michael Okpara University of Agriculture, Umuahia, Nigeria

REHABILITATION FROM MALNUTRITION

25 2001 / Oral rehydration solution containing amylase resistant starch in severely malnourished children with watery diarrhea due to Vibrio cholerae

Nur Haque Alam
ICDDR,B, Centre for Health and Population Research, Dhaka, Bangladesh

26 2004 / Rehabilitation of severely malnourished children in Senegal (West Africa): Use of a local solid food equivalent to WHO F100 with high energetic value. Part II

Salimata Wade
Université Cheikh Anta Diop (UCAD), Equipe de Nutrition, Dept de Biologie Animale, Dakar, Senegal

INFANT AND CHILD NUTRITION

27 2003 / Comparison of the efficacy and acceptability of three types of micronutrient supplements added to complementary foods for infants in Ghana

Anna Lartey
University of Ghana, Department of Nutrition and Food Science, Legon, Ghana

28 2005 / Food-based approach for the control of stunting among preschool children

Chineze Agbon
University of Agriculture, Department of Home Science & Management, Abeokuta, Nigeria

29 2006 / STEP I: Complementary feeding-based approach to alleviate linear growth retardation and nutrient deficiencies in infants aged 6 to 12 months in the south of Benin

Romain A.M. Dossa
University of Abomey-Calavi, Department of Food Sciences and Nutrition, Cotonou, Benin

30 2006 / Promoting breastfeeding: A formative study among women and their husbands with infants aged 0-6 months in urban households

Judhiastuty Februhartanty
University of Indonesia, SEAMEO RECFON, Jakarta, Indonesia

31 2007 / Mangochi Child Nutrition Intervention Study

Kenneth Maleta
University of Malawi College of Medicine, Division of Community Health, Mangochi, Malawi

TITLE

PRINCIPAL INVESTIGATOR

INFANT AND CHILD NUTRITION

32	2007 / Potential of amaranth grain seeds to improve the nutrition and health status of schoolchildren	John Muyonga Makerere University, Department of Food Science and Technology, Kampala, Uganda
33	2007 / Improving nutritional status of children aged 6-18 months in semi-arid area in Kenya: The potential of amaranth seed flour	Alice Mboganie Mwangi University of Nairobi, Applied Nutrition Programme, Uthiru-Nairobi, Kenya
34	2008 / Nutrition, anaemia, growth and oxygen weaning in low-birth-weight oxygen-dependent infants in a Kangaroo Clinic	Nathalie Charpak Fundacion Canguro, Bogota, Colombia
36	2008 / The effect of a 10-month school-based provision of high-calcium milk and weight-bearing exercise program on the bone mineral status of 7- to 9-year-old prepubertal girls	Pura Rayco- Solon Nutrition Center of the Philippines, Manila, Philippines
37	2009 / Food-based approach to alleviate linear growth retardation and nutrient deficiencies in young children aged 6 to 11 months	Romain A.M. Dossa University of Abomey-Calavi, Department of Food Sciences and Nutrition, Cotonou, Benin
38	2009 / Community-based nutrition intervention to improve the nutrient-density of meals for young children (6-24 months)	Margret K Kabahenda Makerere University, Department of Food Science & Technology, Kampala, Uganda
39	2009 / Gestational nutrition, pregnancy outcome and infant growth: A life-cycle approach in a set of Eritrean communities	Azieb Ogbaghebriel College of Health Sciences, Asmara, Eritrea
40	2010 / Effect of fish meal and Vitamin C on the iron status of Ghanaian children consuming cowpea-based food	Godfred Egbi University of Ghana, Noguchi Memorial Institute for Medical Research, Legon, Ghana
41	2010 / Intensive nutrition and hygiene education for improving nutrient intake of children aged 6-11 months	Dwi Nastiti Iswarawanti SEAMEO Regional Center for Food and Nutrition, Jakarta, Indonesia
42	2010 / Testing the efficacy of an audio program and discussion guide in promoting exclusive breastfeeding in Cameroon, Africa	Susanne Montgomery School of Public Health, Loma Linda University, Loma Linda, California, USA

INFANT AND CHILD NUTRITION

43	2010 / Efficacy of combined selenium and iron supplementation on micronutrient status of schoolchildren	Nguyen Van Nhien National Institute for Food Control, Hanoi, Vietnam
44	2010 / Feeding practices in Guatemalan infants: Adherence to the WHO recommendations and barriers to their implementation	Noel Solomons CESSIAM, Guatemala City, Guatemala
45	2011 / Effect of hookworm elimination and vitamin A intervention on anaemic status of preschool children in Sichuan, China (resubmission)	Ke Chen Chengdu Maternal and Children's Health Care Hospital, Chengdu, Sichuan, China

MATERNAL NUTRITION

46	2007 / Nutrition education to improve mother and cadre nutritional knowledge and children nutritional status in Indonesia	Ali Khomsan Bogor Agricultural University, Department of Community Nutrition, Bogor, Indonesia
47	2007 / Effect of tempe and vitamin-C-rich fruit supplementation during pregnancy on iron status and pregnancy outcomes	Maria Wijaya-Erhard University of Indonesia, SEAMEO RECFON, Jakarta, Indonesia
48	2008 / The development of new norms for indicators of iodine status during pregnancy and its impact on the prevalence of mental retardation in children	Chen Zupei Tianjin Medical University, Institute of Endocrinology, Tianjin, China
49	2009 / Impact of daily consumption of vitamin-A-fortified oil on breast milk vitamin A concentration and vitamin A status of lactating Moroccan women	Najat Mokhtar Ibn Tofail University, Nutrition Unit, Kenitra, Morocco
50	2009 / Role of vitamin B12 supplementation during pregnancy and postpartum to alleviate nutritional anaemia in Bangladeshi women and their infants	Towfida Jahan Siddiqua ICDDR, B, Nutritional Biochemistry Lab, Dhaka, Bangladesh

MATERNAL NUTRITION

51	2010 / SMS and web-based support for appropriate infant feeding to prevent childhood obesity in urban China	Hong Jiang School of Public Health, Fudan University, Shanghai, China
52	2010 / Urinary iodine concentration of pregnant women in Zambia as an indicator of their iodine nutrition status	Cyprian Katongo Copperbelt University, School of Mathematics and Natural Sciences, Kitwe, Zambia
53	2010 / Pre-conceptional vs. gestational food supplements and pregnancy outcomes in rural Vietnam	Tu Ngu National Institute of Nutrition, Department of Applied Nutrition & Nutritional Surveillance at the National Institute of Nutrition, Hanoi, Vietnam
54	2011 / Assessment of iodine status in pregnant women and weaning infants in eastern region of Nepal	AK Nepal Department of Biochemistry, B. P. Koirala Institute of Health Sciences, Kathmandu, Nepal

CHILD BEHAVIOURAL DEVELOPMENT

55	2001 / Cognitive performance of iron deficient, non-anaemic Peruvian infants	Theodore Wachs Purdue University, Department of Psychological Sciences, West Lafayette, Indiana, USA
56	2005 / Development of term low-birth-weight infants at 6 years, and the benefits of early stimulation	Susan Walker University of the West Indies, Tropical Medicine Research Institute, Kingston, Jamaica
57	2009 / Food-based intervention and psychosocial stimulation to improve growth and development of <24mo Indonesian children	Umi Fahmida University of Indonesia, SEAMEO RECFON, Jakarta, Indonesia
58	2011 / Effects of maternal iodine supplementation in an area of mild iodine deficiency on infant development to 2 years (a follow-on study to our previous Nestlé Foundation grant)	K Srinivasan St. Johns Research Institute, Bangalore, India

IMMUNE DEFENSE AND INFECTION

59	2002 / Nutrition assessment of children orphaned from HIV/AIDS	Judith A Ernst Indiana University, School of Health & Rehabilitation Sciences, Indianapolis, Indiana, USA
60	2002 / Examination of the relationships between low body mass index and micronutrient malnutrition and the risk of morbidity in adults aged 18 to 60 years in rural Vietnam	Tran Thanh Do National Institute of Nutrition, Hanoi, Vietnam
61	2004 / Molecular and biochemical analysis of intestinal microflora in malnourished children with cholera treated with oral rehydration solution with and without amylase resistant starch	Motiur Rahman ICDDR,B, Centre for Health and Population Research, Dhaka, Bangladesh
62	2010 / The role of sub-clinical inflammation on micronutrient status of Myanmar adolescent girls during micronutrient supplementation	Min Kyaw Htet SEAMEO TROPMED Network, Jakarta, Indonesia
63	2011 / Exploration of Myanmar rural caregivers' concepts on childhood diarrheal disease (6-24 mo) and its management related to ORS use and feeding	Khaing Mar Zaw SEAMEO RECFON UI, Jakarta, Indonesia

EPIDEMIOLOGIC TRANSITION

64	2003 / Assessing physical activity of obese children by a clinical score	Claude Godard INTA, Unidad de Endocrinologia Infantil, Santiago, Chile
65	2004 / Changing diets, levels of physical activity and environments and their relationship to the emergence of adolescent overweight and obesity in Ho Chi Minh City, Vietnam	Hong K Tang Community Health Department, Training Centre for Health Care Professionals, Ho Chi Minh City, Vietnam
66	2007 / Diet, physical activity or environmental change: what are the key factors underlying the emerging child obesity epidemic in Ho Chi Minh City, Vietnam	Hong K Tang Community Health Department, Training Centre for Health Care Professionals, Ho Chi Minh City, Vietnam
67	2009 / A pilot study of school-based peer education and obesity-related behaviours in adolescents in Beijing, China	Zhaohui Cui University of Sidney, The George Institute for International Health, Sidney, Australia

BONE HEALTH

68	2003 / Heritability, nutrition and adolescent bone health	Ghada El-Hajj Fuleihan American University of Beirut, Calcium Metabolism & Osteoporosis Program, Beirut, Lebanon

NUTRITION INTERVENTIONS

69	2003 / School-based nutrition intervention pilot program	Dien N Le Institute of Nutrition, Ho Chi Minh City, Vietnam
70	2005 / A community-based randomized controlled trial of complementary feeding strategies in a squatter settlement of Karachi	Zulfiqar Ahmed Bhutta Aga Khan University Medical Center, Department of Paediatrics and Child Health, Karachi, Pakistan

NUTRITION EDUCATION

71	2006 / Application of learning technologies to support community-based lay health care workers and build capacity in chronic disease prevention in Thailand	Rhona M. Hanning University of Waterloo, Department of Health Studies and Gerontology, Waterloo, Ontario, Canada
72	2008 / Care empowerment of mothers, cadres, and premarried women to improve children nutritional status (resubmission)	Euis Sunarti Bogor Agricultural University, Department of Family and Consumer Science, Bogor, Indonesia
73	2011 / A multi-approach intervention to empower posyandu nutrition program to combat malnutrition problem in rural areas (resubmission)	Ali Khomsan Bogor Agricultural University, Department of Community Nutrition, Bogor, Indonesia

OTHER RESEARCH AREAS

74	2004 / Genetic diversity and selection of cassava (Manihot esculenta Crantz) with high beta-carotene content using molecular markers	Claudia Fortes Ferreira Embrapa Mandioca e Fruticultura, Cruz das Almas - BA, Brazil
75	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
76	2008 / Contribution à l'amélioration de l'état nutritionnel et sanitaire des enfants de 06 a 59 mois dans la commune de bopa par des actions communautaires	Romain A.M. Dossa University of Abomey-Calavi, Department of Food Sciences and Nutrition, Cotonou, Benin
77	2010 / Improving nutritional status of schoolchildren through consumption of cowpea: A food sovereignty perspective	Abdul-Razak Abizari School of Medicine and Health Sciences, Community Nutrition Department, Tamale, Ghana
78	2010 / Pilot study to assess the acceptability of pearl millet grain at macro- and micro-levels in rural Eastern Kenya	Mueni Hellen Ndiku University of Eastern Africa, Baraton (UEAB), School of Sciences & Technology & Department of Public Health, Eldoret, Kenya
79	2011 / Factors influencing household nutritional status in relation to increasing food prices in Sri Lanka	Mahinda Lal Baddawelage Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka
80	2011 / Effectiveness of nutrition package in improving growth of rural children (6-23 months): A cluster randomised trial	Kissa B.M. Kulwa Sokoine University of Agriculture, Department of Food Science & Technology, Morogoro, Tanzania

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Long KZ, Santos JI, Rosado JL, Estrada-Garcia T, Haas M, Al Mamun A, DuPont HL, Nanthakumar NN. Vitamin A supplementation modifies the association between mucosal innate and adaptive immune responses and resolution of enteric pathogen infections. Am J Clin Nutr 2011;93:578-85.

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Sranacharoenpong K, Hanning RM. Developing a diabetes prevention education programme for community health-care workers in Thailand: formative findings. Prim Health Care Res & Dev 2011;12:357-69.

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Yang H, Qian M, Ding W, Gebre-Medhin M, Yan Y, Chen Z. A comparison study of two reference data for evaluation of thyroid function in pregnancy. Tianjin Med J 2011;39:299-302.

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 is and has been financially and operationally independent of the Nestlé Company since its inception. 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 45 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 may possibly be considered for support if the applicant can offer specific and convincing evidence and justification for the choice of the research topic.

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.

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) large-budget projects, meaning projects that exceed USD 100,000 per year or USD 300,000 over the total duration of a 3-year project

(5) nutrition surveys or surveillance studies

(6) 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

(7) in vitro and/or animal experiments.

Although obesity and related diseases are of emerging importance in several low-income countries, the Foundation does not generally support projects in this specific area unless the proposal demonstrates linkages with under-nutrition, and the protocol is innovative and exceptionally well justified.

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):

A. Research Grants

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 of the Foundation 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**

B. 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 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 five Council Members and Advisors. All Council Members and Advisors are internationally well-known scientists with a 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.

Council Members

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