



Nestlé Foundation

for the study of problems of nutrition in the world



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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

THE FOUNDATION AT A GLANCE

EVIDENCE-BASED – PROACTIVITY

PARTNERSHIP – FOR LONG-TERM SUCCESS

enLINK-ing FOR A BETTER WORLD



CAPACITY BUILDING



enLINK-ing FOR A BETTER WORLD



PUBLIC HEALTH ORIENTATED

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A large, close-up photograph of a group of African children and women. In the foreground, several young children with dark skin and curly hair are looking directly at the camera with serious expressions. Behind them, a woman wearing a colorful headscarf is visible, along with other children. The background is slightly blurred, suggesting an outdoor setting with trees.

PRESIDENT'S MESSAGE

The Nestlé Foundation has a challenging mandate: "to study the problems of nutrition in the world". It is estimated that over 800 million people suffer from under-nutrition, while over-nutrition affects an even larger number of individuals. Our foundation focuses its activities on malnutrition in low-income countries, with the aim of finding solutions to the local problems. This is a very difficult task because political, socio-economic issues, poverty and lack of education are major factors contributing to malnutrition. Yet, well-designed studies to identify the specific nutritional needs of underprivileged populations are needed before adequate interventions can be implemented. In spite of the great scientific improvement in the knowledge of the causes of malnutrition, food insecurity, hunger

and under-nutrition are still prevalent in many low-income countries. What is lacking is implementation of adequate knowledge and behaviour in the fields of hygiene, nutrition and prevention of communicable diseases.

In the "Vision" section of this report, one of our council members, Professor Jehan-François Desjeux, describes how to reach an important goal, namely meeting the nutritional requirements of a household in a low-income country by eating locally available foods. This is a difficult challenge even for nutritionists responsible for feeding communities. The use of a computer programme called "NutriSurvey" allows for an assessment of whether the food basket brought home by the mother fulfils

the recommended dietary allowances of her family. The programme may point to specific nutritional deficits of the everyday diet and it proposes food-based solutions to meet the nutritional requirements. A major advantage of this approach is the fact that the programme takes into account the limits of food availability and its cost. The programme can help the investigator in predicting if a research project is correctly designed to reach the goal of improving the nutritional status of the population to be studied. The Foundation plans to promote the use of the "NutriSurvey" programme with the aim of assessing whether a food-based intervention falls within reasonable limits of nutritional value, availability, acceptability and cost for the household members.

Our policy is to encourage scientists from low-income countries to submit applications to solve local problems of nutrition that they identify themselves. It is important that local scientists submit their research ideas and plans because the ownership of the application is a factor of motivation. Council members, advisors and Dr. Suter, the Director, are instrumental in improving the submitted applications before they are accepted. A key point is to be able to carry out a scientific evaluation of the results of an intervention.

It has become evident that improving education not only of mothers in rural areas, but also of health personnel and university students is a priority in many low-income countries. A visit to several universities in Africa has shown us a dramatic lack of scientific literature; the absence of scientific journals and of recent textbooks illustrates the gap in knowledge transfer from developed to developing countries. A few years ago, the Nestlé Foundation created the enLINK digital library, free internet access to scientific journals in the field of nutrition for scientists in low-income countries. This initiative is a great success and each month new scientists benefit from this digital library. We felt, however, that this was not enough because university libraries in many low-income countries remain empty! To contribute to improve this dramatic situation, the Foundation created an enLINK library trunk. This is an orange metal trunk that contains more than 120 recent books, brochures and guidelines in the fields of nutrition, hygiene and internal medicine. This trunk is being offered to 13 universities, mainly in African countries. We have identified scientific colleagues in these universities who will be responsible for an effective use of the library trunk. After an evaluation of the results of this initiative, we plan to extend the delivery of this trunk to universities in many low-income countries, including Asia and South America. We also plan to create a small trunk with mainly guidelines and applied textbooks to be given to personnel of health units in developing countries. Through these activities,

we hope to bring a modest contribution to people's education, trying to comply with a Chinese proverb: "If you are planning for a year, sow rice; if you are planning for a decade, plant trees; if you are planning for a lifetime, educate people."

We are honoured that two outstanding scientists have joined the Foundation as advisors: Professor Robert Russell, Director of the Jean Mayer USDA Human Nutrition Research Center on Aging, Tufts University, Boston, USA, and Professor Kraissid Tontisirin, Senior Advisor, Mahidol University, Salaya, Thailand, recently retired from his position as Director of Nutrition Division at FAO, Roma. The Foundation is grateful to benefit from the advice of such renowned colleagues.

It is a pleasure to thank the Council members and advisors for their many contributions to our activities. The Director, Professor Paolo Suter, is the main promoter of the activities initiated by the Foundation and I am very grateful to him for these achievements. I also thank Mrs. C. Lieb, the assistant to the Director, for her dedication to the everyday tasks. I also want to express my gratitude to Mr. Peter Brabeck, President and Chief Executive of the founding company, to Mr. Richard Laube, Director, and to Dr. Irène Cortésy for their interest and support.



Prof. Dr. E. Jéquier
President Nestlé Foundation



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 programmes. 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.

This year the mobile enLINK nutrition library trunk has been added.

PROJECTS INITIATED BY THE FOUNDATION

THE enLINK INITIATIVE

- Study of the Vitamin A value of spirulina carotenoids in humans
- The enLINK micronutrient powder
- The enLINK digital library
- The enLINK library trunk: the orange library



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.

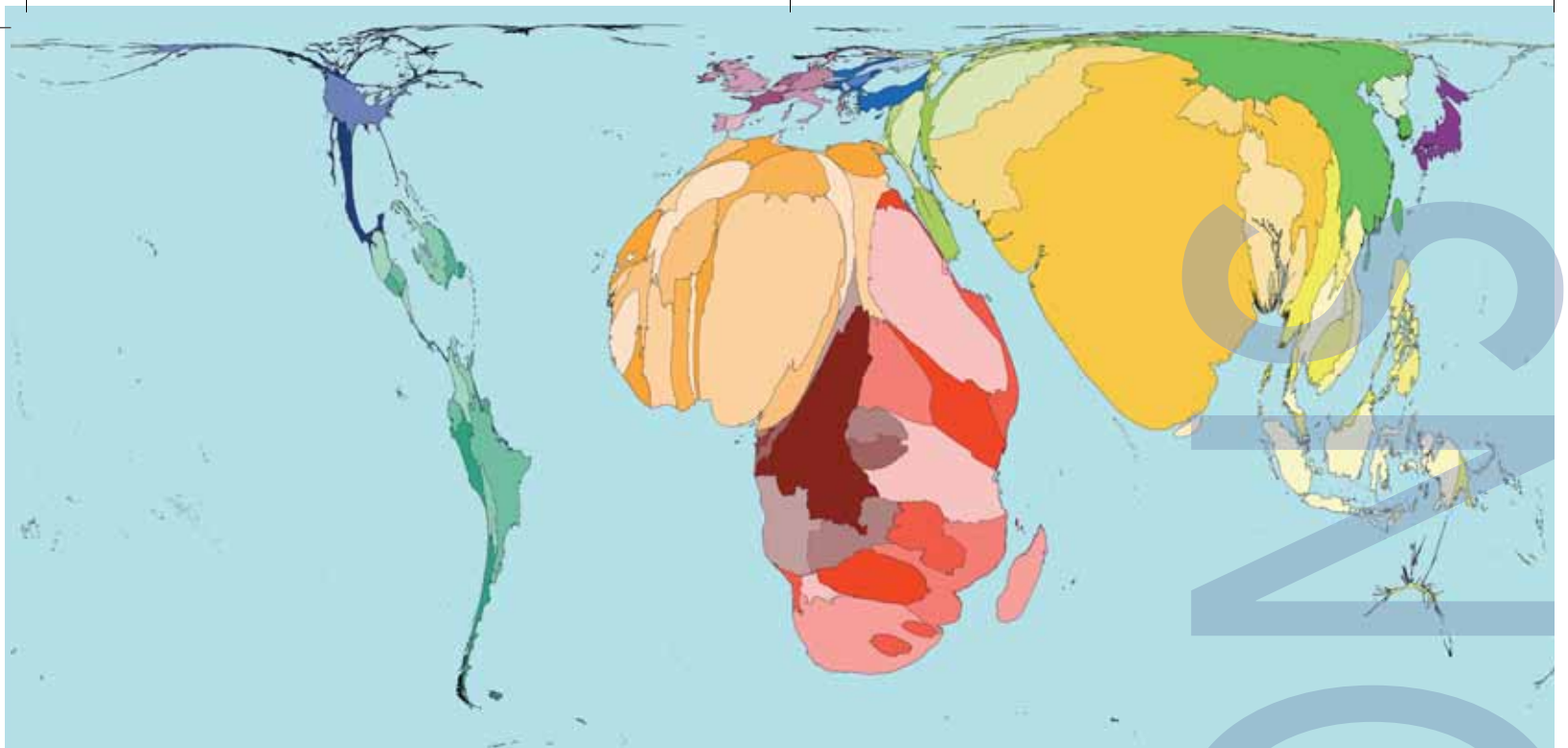
The **enLINK** Initiative has three main levels:

1. **e**xploration in **n**utrition, which represents the research level
2. **e**ducation in **n**utrition, targeting populations such as researchers, medical doctors, or health care workers, or the general population or specific population groups such as women
3. **e**ndurable **n**utrition

The elucidation of the bioavailability of provitamin A from spirulina algae represents the first project in the exploration section of the **enLINK** Initiative. The **enLINK** powder is the first project of the endurable nutrition aspect of the initiative.

The **enLINK** library – the electronic nutrition library – represents the core component of the educational level of the initiative. Information access is the key issue in education and for any advancement. Despite the internet, printed documents in the form of books and other publications remain the cornerstone for education and information transfer. This is especially true for low-income countries where internet access is not yet fully developed or even lacking. Therefore books and printed materials are indispensable. The orange **enLINK** library trunk is the new addition for sustainable capacity building.

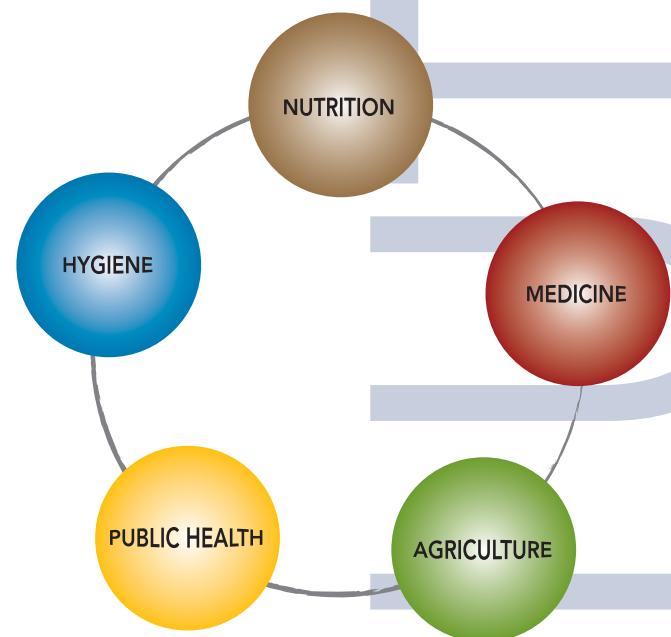




ENLINKING SOLUTIONS

The only constant in life is change. This basic fact of life is applicable also to solutions in the fight against poverty, malnutrition and hunger. The Foundation has been engaged in the study of the problems of nutrition in the world for more than 40 years. During these decades it was recognized that enLINKing the different key disciplines for well being (see Figure 1) will also reduce the barriers against implementation of the knowledge and help achieve improvement. The knowledge and means to reduce malnutrition is there but the translation of this knowledge into action is in many instances lacking or not sustainable. This is often due to isolated activities by individuals and organizations focusing only on their area of interest. There is a need to enLINK. This is also shown on the Worldmapper map "Often Preventable Deaths" above. Infectious and parasitic diseases account for nearly 60% of the preventable diseases, followed by respiratory infections, maternal diseases, perinatal conditions and, last but not least, nutritional deficiencies. Nutritional deficiencies lead to a "malnutrition-induced immuno-deficiency syndrome" which then allows most of these preventable diseases to develop. The size of a given territory on the map is in proportion to the absolute number of people who died from these most preventable diseases in one year. Addressing all five key fields of intervention represents the most promising way to reduce the disease burden.

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



A project initiated by the Foundation:

BETTER THAN CARROTS: SPIRULINA TO FIGHT VITAMIN A DEFICIENCY

Vitamin A deficiency (VAD) represents the most important preventable single cause of childhood blindness, morbidity and mortality. The major strategies to combat VAD are an improved diet (including breastfeeding from vitamin-A-sufficient mothers), supplementation and/or food fortification. Whenever possible the Foundation favours a food-based approach.

Recently the Foundation initiated and supported a study using the newest technology to evaluate the bioavailability of provitamin A (β -carotene) from spirulina. The vitamin A value (equivalence) of spirulina using intrinsically deuterium-labeled spirulina and an isotope vitamin A reference has been studied. Compared with $^{13}\text{C}_{10}$ retinyl acetate, the conversion factor of spirulina β -carotene to retinol was 4.0 ± 1.5 (range 2.1 – 6.1) : 1 by weight. This study is the first study which showed that spirulina β -carotene can be converted to retinol efficiently in humans. The conversion rate is much better than in carrots or spinach and the individual

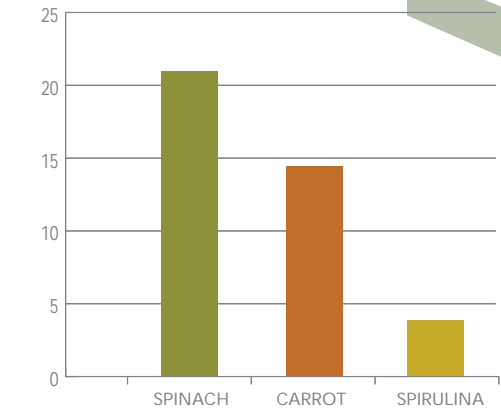
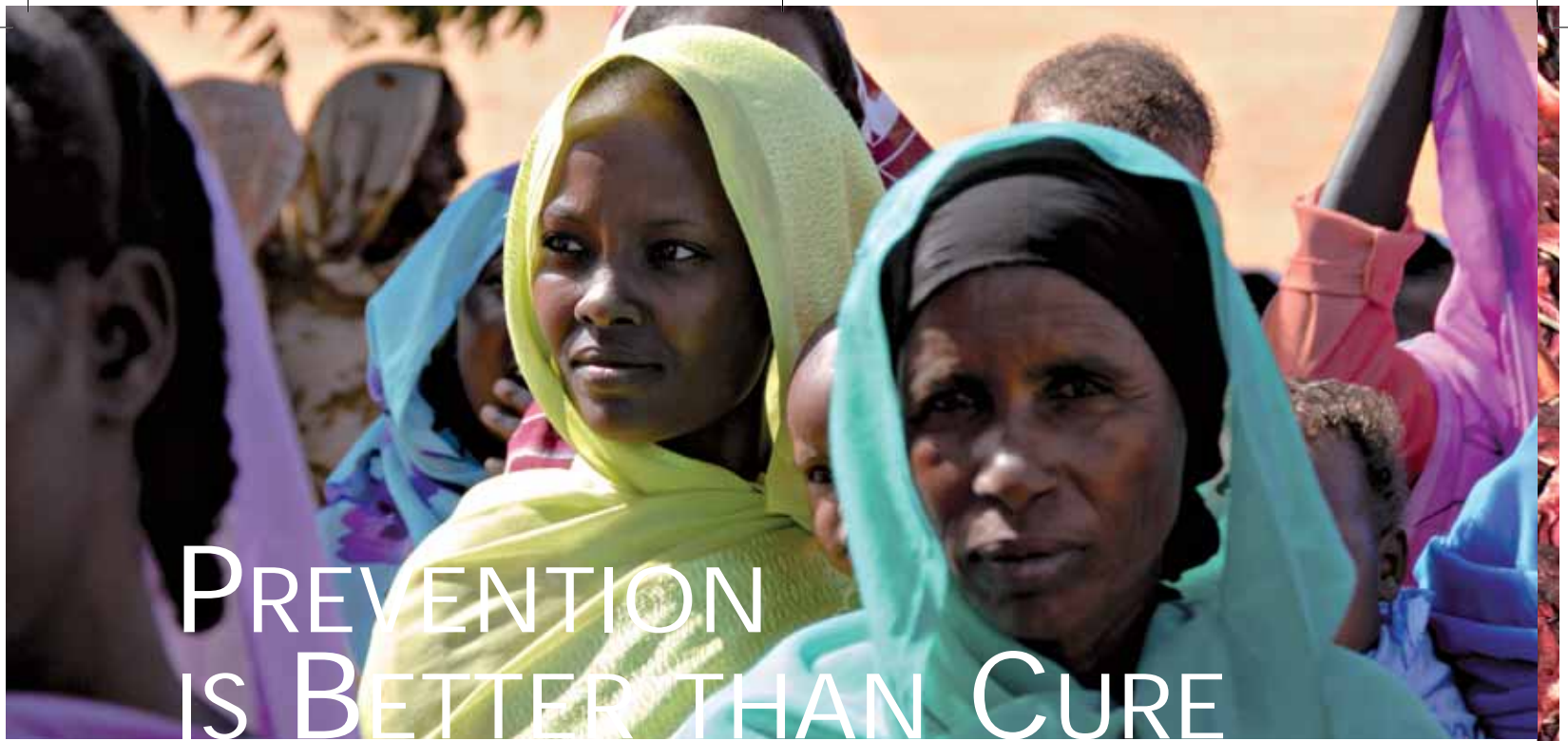


Figure 1: Conversion efficiencies of spinach, carrot and spirulina β -carotene to vitamin A as compared to an isotope reference dose of vitamin A. The smaller column corresponds to a better conversion rate (mean \pm SD), i.e. better bioavailability of the provitamin A.

variability of the conversion rate is much smaller (see Figure 1). Since the majority of the world's population depends on plant sources of provitamin A, the findings from this study are of significant relevance to public health and support different strategies to promote local spirulina cultivation and consumption. Before this can be done on a broader scale, a well-controlled intervention study has to prove the applicability. Despite the promising results one should not forget that the introduction of spirulina into the dietary pattern of a spirulina-naïve population and society is not an easy undertaking.





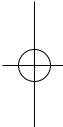
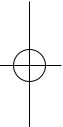
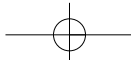
enLINK MICRONUTRIENT POWDER

The food-based approach of the Foundation to promote nutritional adequacy is well known and widely appreciated. However, sometimes food is not enough. Often one encounters a setting where food is available but nevertheless there is an insufficient consumption of protein and energy and thus also micronutrients, which in the long run will lead to malnutrition.

Following the saying "Prevention is better than cure" the Foundation, in collaboration with a research group at the Aga Khan University in Karachi (Pakistan), tested a micronutrient powder with a small amount of selected micronutrients for use as an addition to complementary food. The amount of micronutrients (Vitamin A, iron, iodine, zinc and vitamin C) in this preparation is considerably lower than the current RDA. The purpose of the preparation is twofold: It should prevent micronutrient malnutrition and enhance the appetite, and thus increase the usual food intake, by improving the taste of the food to which it is added.

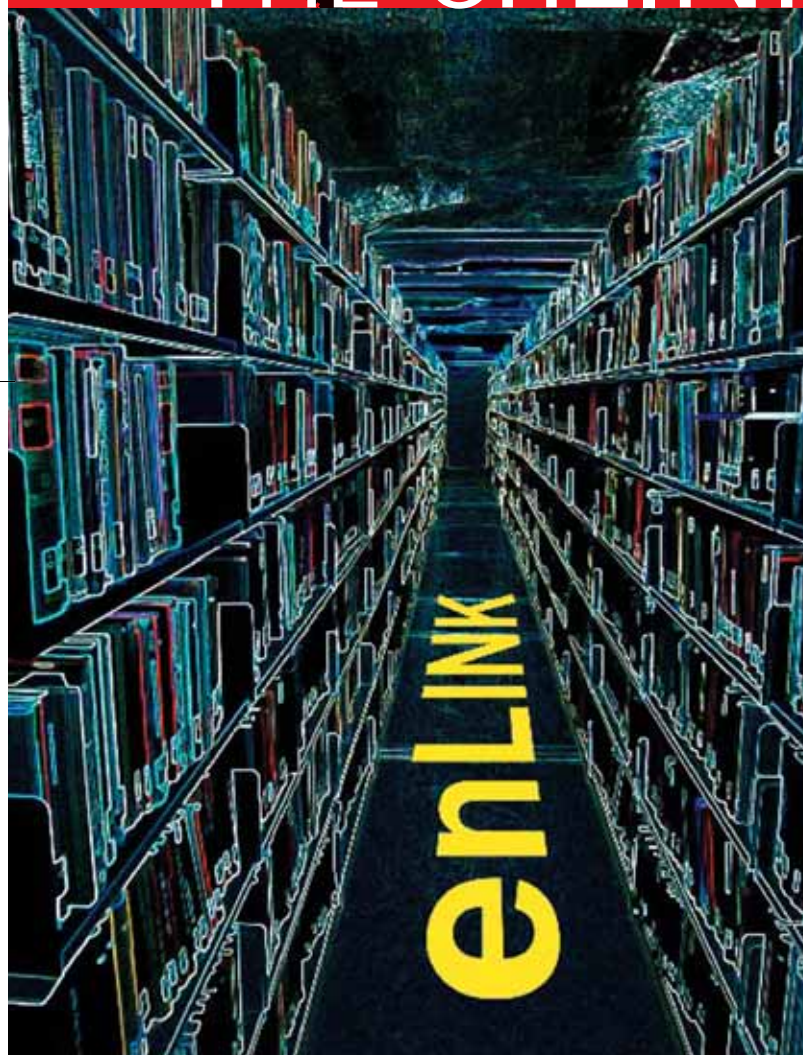
Delivering some micronutrients and simultaneously increasing food intake by enhancing the appetite bears a high potential of "double success" for improving energy and micronutrients nutriture.

The data collection was completed in November 2007. The preliminary results are promising and hint at the high potential of the enLINK powder.





THE enLINK LIBRARY



Without access to information there is no education. Four years ago the Foundation constructed the enLINK digital library of nutrition research, which is now appreciated by users in over 30 different low-income countries. This library is a concerted action between OVID Technologies, certain publishers and the Foundation.

For nutrition information the enLINK library is already an established and appreciated source of information. The enLINK library targets individual users and so far 75 registered users have access to this unique library.

Scientific nutrition journals contain mostly the latest studies and ongoing developments in the field of nutrition research. The knowledge base of nutrition is summarized in different nutrition textbooks. Since spring 2006 the classic nutrition textbook *Modern Nutrition in Health and Disease* (edited by Maurice E. Shils) has been available online for enLINK users.

Since know-how and different disciplines have to be enLINKed, other e-books will be added to the collection in the near future.

Interested in having free full-text access to the digital enLINK library? 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.

enLINK statistics as of December 31, 2007:

- 75 users from 32 countries
- More than 26,000 page views per month
- More than 850 page views per day

Colour: orange

Height: 1.0 m

Weight: 80 kg

Number of books: 35

Number of brochures, booklets, etc: 100

Total number of pages: 30,000

The Orange Library

THE enLINK LIBRARY TRUNK— THE ULTIMATE LIBRARY FOR NUTRITION

These are the impressive characteristics of the mobile enLINK nutrition library for institutions in low-income countries. According to medical criteria the enLINK trunk is definitively too heavy for its height – but as a rare exception these dimensions are welcomed since it represents a condensation of nutrition knowledge in a mobile trunk library.

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 sciences, 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 to the digital enLINK library (see <http://www.enlink.org>) the Foundation created a small, traditional, "paper-based" mobile enLINK library. The mobile enLINK library represents an orange-coloured metal trunk containing more than 100 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 the Harrison's textbook of medicine or 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 combined use of both trunks will without a doubt have a booster effect on the capacity of many institutions in low-income countries.



Without any prejudice it can be said that the trunk library in combination with the enLINK digital library represents the ultimate nutrition library, representing the basis for new capacity building for students in the field of nutrition but also as a booster and knowledge source for experts in the field.

The enLINK nutrition library trunk will initially only be offered as a present to selected nutrition institutes in low-income countries.

The order of the mailing of the first 13 trunks was set by early 2008. The 13 orange trunks will be mailed to nutrition institutes in the following countries:

- Benin
- Burkina-Faso
- Cameroon
- Eritrea
- Ghana
- Iran
- Madagascar
- Nigeria
- Senegal
- Sudan
- Uganda
- North and South Vietnam
- Zimbabwe

Obviously, health care specialists working in the field with the population and patients do not necessarily have access to a library. They also have other needs. The power of knowledge can only work when it trickles down and is implemented. Therefore the Foundation decided to create, in addition to the large orange trunk, a smaller enLINK trunk available for smaller groups and selected frontline individuals in contact with those at the bottom of the pyramid.

30,000 pages of nutrition knowledge!



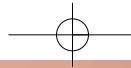
PRESENT KNOWLEDGE IN NUTRITION

Time is knowledge. Despite the increase in the availability of information in modern societies, in many parts of the world access to information is limited and still a time-consuming task.

"Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information on it." This saying from Samuel Johnson illustrates nicely the capacity-building activities of the Foundation. Present knowledge in nutrition can either be found in the enLINK digital library or in one of the leading textbooks about human nutrition, *Present Knowledge in Nutrition* (PKN).

Again in 2007 several hundred volumes of *Present Knowledge in Nutrition* (8th edition, 2002, ISBN: 3930954958) were shipped free of charge to interested individuals and institutions in countries such as Nigeria, Tanzania, Ivory Coast, India, Morocco and Indonesia. Since the start of the initiative more than 3,000 books have been sent to nearly 30 countries. This enLINK initiative is a concerted action of the Foundation and the International Life Science Institute (ILSI) in Washington, D.C. (USA). ILSI donated the 8th edition of the book and the Foundation financed the shipment.

Interested in receiving a free copy of the textbook *Present Knowledge in Nutrition* in English or Spanish? If you are from a low-income country and if you are working in your country of origin, get the order form at www.nestlefoundation.org.



Knowledge is like a garden: If it
is not cultivated, it cannot be
harvested.

Guinean Proverb





In May 2007 the Federation of African Nutrition Societies (FANUS), in collaboration with the Moroccan Society of Nutrition (MSN), organised the first FANUS meeting on "Nutrition health and human development in Africa: Breaking the downward trend". The FANUS conference intended to bring together African and international researchers and experts in the field of nutrition to share their research findings and to discuss strategies to solve the nutrition problems on the African continent.

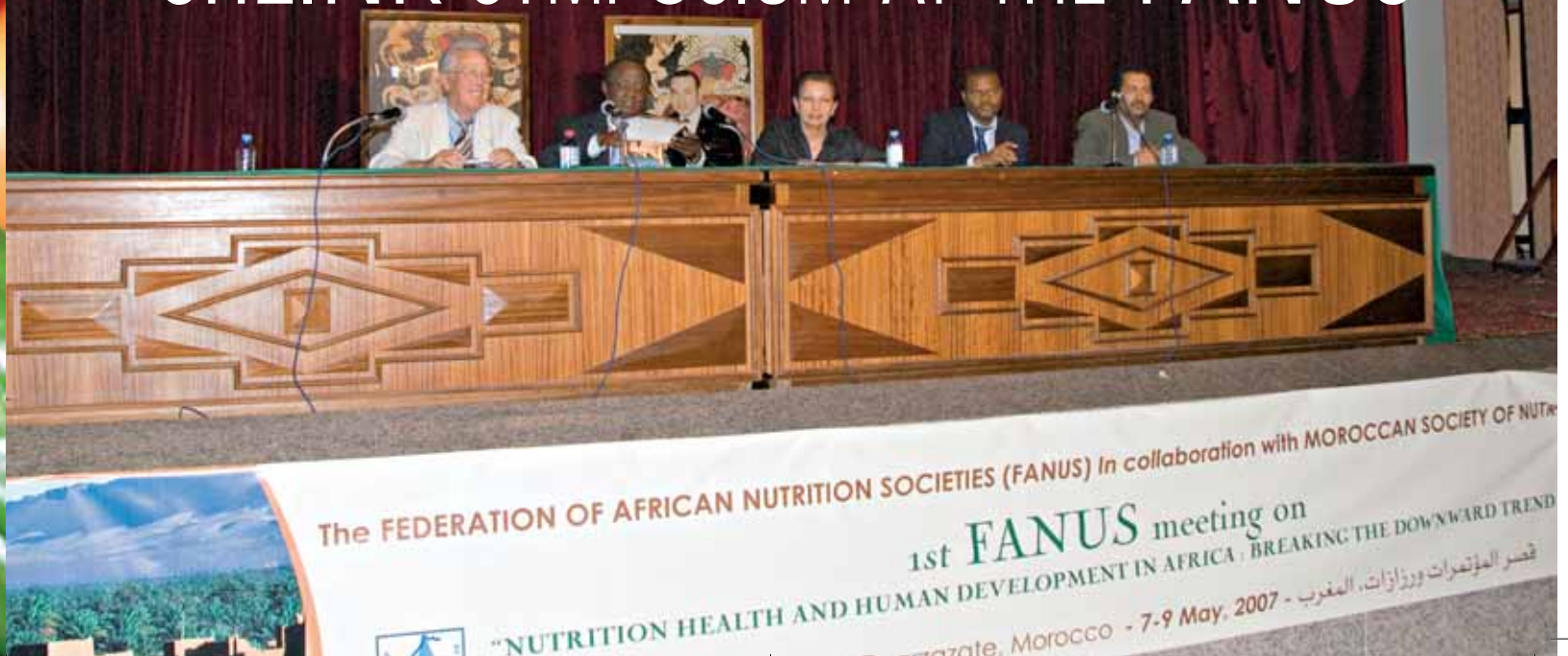
On the second day of the three-day meeting, an enLINK symposium entitled "Nutrition education and information access in Africa: Status and needs" was held in the main auditorium of the Ouarzazate Conference Centre. Professor Tola Atinmo (Nigeria, current president of FANUS) set the stage in his speech entitled "Do we need nutrition education in Africa?". Everybody agreed that the title of his presentation is a rhetorical question and that nutrition education at all levels is more needed than ever. The problems of undernutrition but also of overnutrition can only be solved and controlled by reliable nutrition education. The director of the Foundation, Prof. Paolo Suter, presented the different strategies of the enLINK initiative of the Foundation: the enLINK digital library, the hard copy initiative for nutrition textbooks and the enLINK trunk (see also page 15). Prof. Romain Dossa (Benin) outlined the approach to nutrition education in Benin and West Africa. In this context he pointed out that the FINSA course (see page 28 in this report) represents one of the key nutrition courses in French in Africa. Dr. Mohamed Ag Ayoya (Mali, presently working for UNICEF) presented as the founding president of the African Nutrition Graduate Network (AGSNet) the view from the younger and future generation of nutrition researchers in Africa. Dr. Ag Ayoya emphasised

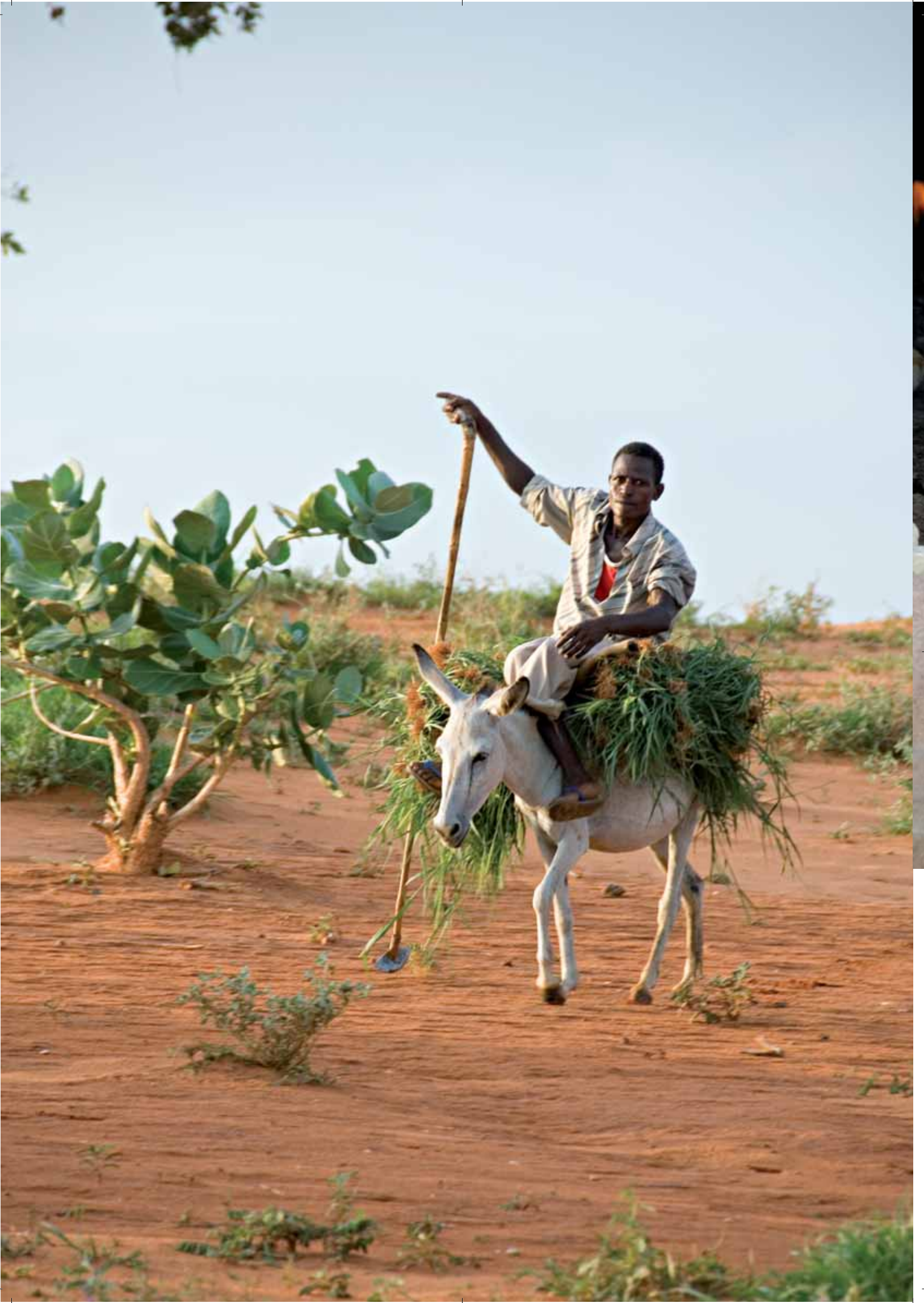
the importance of the African nutrition graduates applying their know-how back home on the African continent.

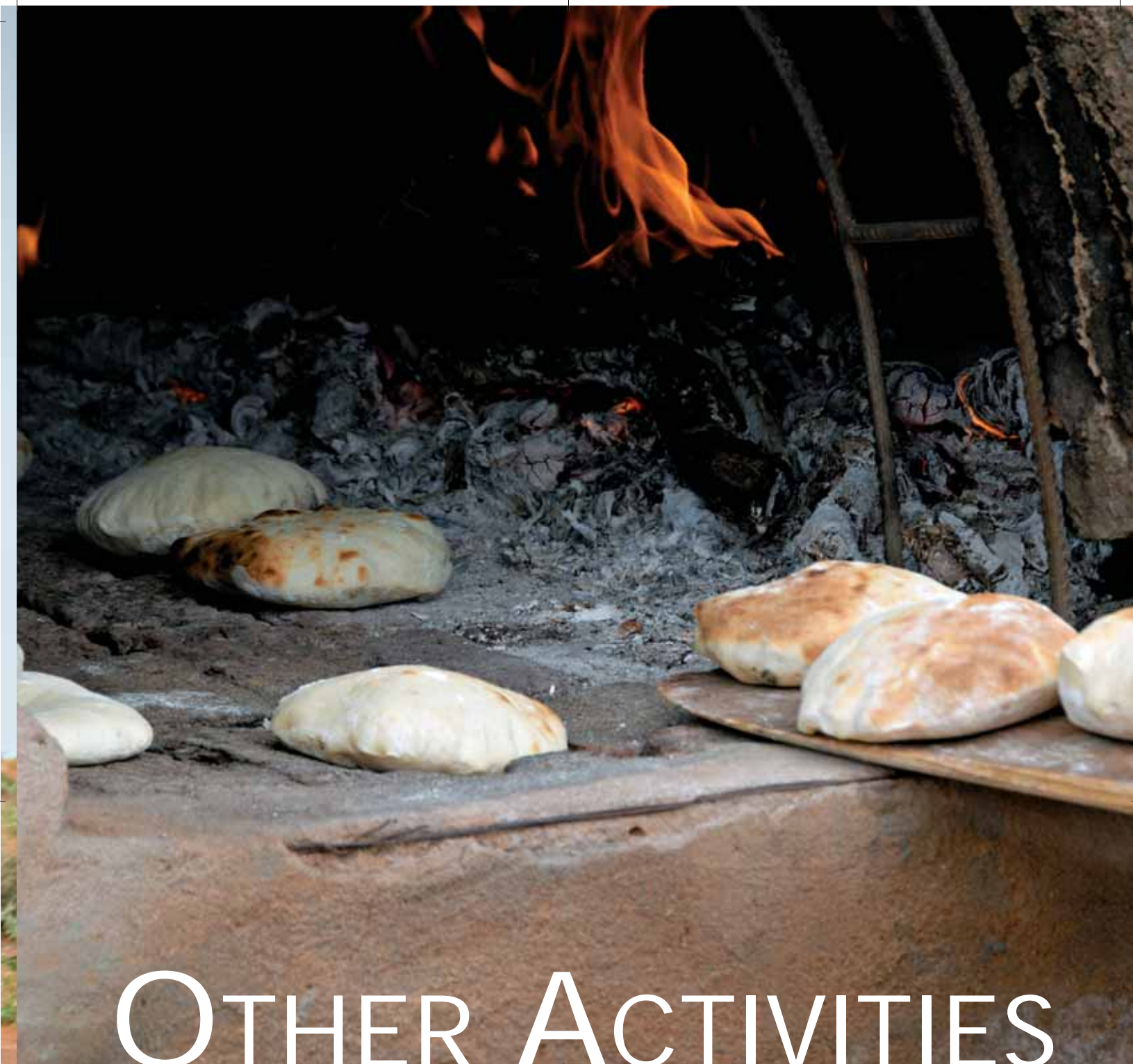
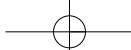
No doubt a new horizon – and also new hope – will be opened by the younger generation of African researchers who intend to apply their knowledge to the improvement of health and life on the African continent. Prof. Wilna H. Oldewage-Theron (South Africa) outlined in her speech, "Nutrition education in South Africa: Status and needs", issues around nutrition education at the population level regarding cardiovascular disease. The symposium was chaired by Prof. Rekia Belahsen (Morocco), Prof. Tola Atinmo and the president of the Nestlé Foundation, Prof. Eric Jéquier.

During the plenary discussion the endeavours of the enLINK initiative to offer digital as well as paper-based means for education in nutrition to individual users were welcomed by all panel members as well as by many members of the audience. All speakers highlighted the crucial role of information access. It was stressed that the FANUS meeting and especially also the enLINK symposium represent a key strategy for "breaking the downward trend" but that it should not be forgotten that the present knowledge also has to trickle down to the population and that the available knowledge should lead to the sustainable implementation of the existing know-how, thus leading to better health and finally a better life. Several of the symposium participants mentioned that it is time that the knowledge is carried out of the lecture halls of the world into the real world to those who need it!

enLINK SYMPOSIUM AT THE FANUS





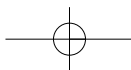


OTHER ACTIVITIES

NEW RESEARCH PROJECTS

INSTITUTIONAL SUPPORT

OTHER CAPACITY-BUILDING ACTIVITIES



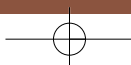


CHILD FEEDING

MICRONUTRIENTS

NEW RESEARCH PROJECTS

NUTRITION DURING PREGNANCY



CHILD FEEDING

Mangochi child nutrition intervention study

Kenneth M Maleta & Per Ashorn

Division of Community Health, College of Medicine, University of Malawi and Division of International Health, University of Tampere Medical School, Tampere, Finland
USD 72,038

Undernutrition is a major health problem for children in rural Malawi. Almost 20% of all infants are born with a low birth weight and 50% develop underweight or stunting in childhood. Perinatal and neonatal mortality is frequent and almost 20% of all newborns die before the age of five years. Half of these deaths are associated with undernutrition. Researchers at the University of Malawi have previously shown that dietary intake of highly nutritious peanut-based spread (fortified spread, FS) efficiently promotes weight and length gain among severely undernourished children in Malawi. Preliminary data also suggest that FS may prove helpful in home-based management of infants and children with less severe forms of undernutrition and that complementary feeding with similar spreads may significantly reduce the incidence of severe stunting. In the present proposal the researchers propose to implement two randomised, controlled parallel group single-blinded clinical trials, with the aim of proving a hypothesis that underweight infants and children eating 300 g/week FS or 500 g/week maize-soy flour gain more weight and length over a 12-week follow-up than infants not receiving food supplementation. The two trials differ in their setting, as one of them is an efficacy trial where supplements are home-delivered weekly and the other one is an effectiveness trial, where parents collect the supplements monthly from a local health centre. The total sample size for the two trials is 480 infants. Two students will be involved in this research project for their degree program in nutrition. To enhance the capacity of the College of Medicine in the field of nutrition research this project will be supported indirectly by transforming the grant application into a fellowship for two students (see Institutional Support).

Improving nutritional status of children aged 6-18 months in a semi-arid area in Kenya: The potential of amaranth seed flour

Alice Mboganie Mwangi

Applied Nutrition Program
University of Nairobi
Uthiru, Kenya
USD 30,000

Poor complementary feeding practices continue to be a major bottleneck to reducing malnutrition in developing countries. A study done in Kenya shows that complementary feeding in the semi-arid areas is a problematic issue with early introduction of poor quality complementary foods, mainly thin, low-energy maize porridge. Chronic food insecurity is a major concern in Kenya and therefore programs that could help diversify and improve the quality of dietary intake such as food-based approaches will go a long way in fighting malnutrition. Promotion and consumption of amaranth seed, which has a high iron and protein content, may offer a viable solution in an area where animal-source foods may not be affordable. A year-long, community-based pilot nutrition education programme and provision of formulated organoleptically acceptable amaranth-seed-enriched flour mix intervention will be undertaken in two rural villages within the Machakos district to try to overcome these problems. The goal of the proposed intervention is to improve young children's nutritional status through enhanced micronutrient intake and parents' awareness of infants' feeding needs in the first two years of life. Promoting continued breastfeeding for the first year and feeding adequate amounts of appropriate energy- and nutrient-dense locally available complementary foods on a daily basis will be the basis of this intervention. The overall hypothesis is that children receiving porridge made from amaranth seed flour will have better nutritional and micronutrient status after the intervention. The sample will be randomly selected from households with a child aged four to six months until a sample size of 225 is reached, with a sample size of 75 per treatment group as follows: Daily provision of porridge made from amaranth-seed-enriched flour and nutrition education group, nutrition education only and a control group. The children will be followed up for one year. Nutrition status will be evaluated at regular intervals. It is believed that there will be an improvement in nutrition status, micronutrient levels and more awareness of good complementary feeding practices in the intervention group.

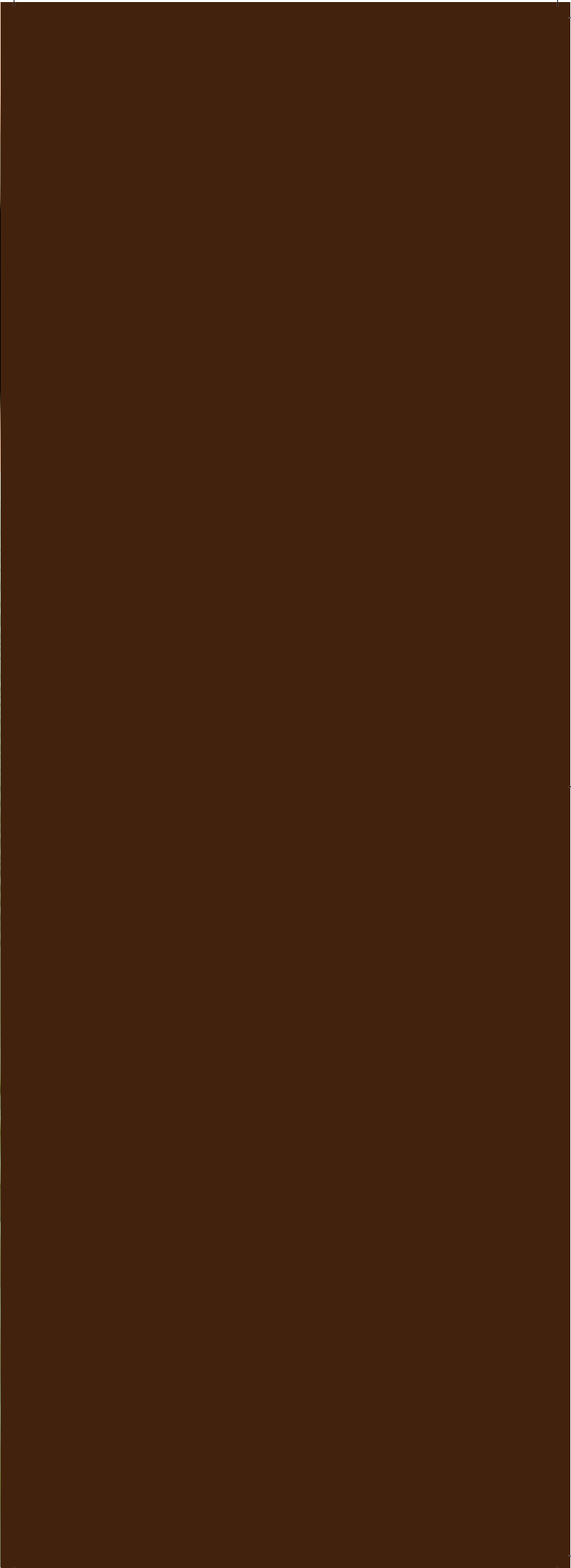
Potential of amaranth grain seeds to improve the nutrition and health status of school children

John Muyonga

Department of Food Science & Technology
Makerere University
Kampala, Uganda
USD 36,000

Malnutrition is widespread in developing countries, especially among children. Child malnutrition is associated with up to 54% of child deaths in developing countries. In Uganda, a large proportion of children under five years of age are malnourished: 39% are stunted and 23% are underweight. About 60% of all deaths of children under five in Uganda are directly or indirectly attributable to diarrhoea and malnutrition. There is a need for nutritious foods that can be used to fight malnutrition. Grain amaranth has higher levels of protein than most grains and the amino acid composition of its protein compares with the FAO/WHO protein standard. Amaranth grain contains twice the level of calcium in milk, five times the level of iron in wheat, and higher sodium, potassium, phosphorus, and vitamins A, E, C and folic acid than cereal grains. Amaranth grain consists of 6 to 10% oil, which is predominantly unsaturated and is high in linoleic acid. There are claims of phenomenal improvements in the general well-being of individuals who include amaranth grain seeds into their diets, including reduction in symptoms of severe malnutrition. The proposed study will investigate the nutritional composition of amaranth grain and nutritional benefits of consuming grain amaranth. In this study, amaranth will be incorporated into the diets of school children and its effect on their nutritional status will be evaluated. During feeding, nutrition and health status will be monitored by periodic anthropometry, disease-specific morbidity and health indicators. Nutritional benefits of increased amaranth consumption will be disseminated to communities through community leaders and nutrition and health workers.





MICRONUTRIENTS

Iodine supplementation in mild-to-moderately iodine-deficient pregnant women: Effects on pregnancy outcome and infant development

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USD 125,380

Severe iodine deficiency (ID) during pregnancy increases the risk of spontaneous abortion, low birth weight and infant mortality, and impairs motor and cognitive performance in the offspring. However, the potential adverse effects of mild-to-moderate iodine deficiency during pregnancy are much less clear. Globally, India is the country with the largest number of newborns – over 12 million per year – born 'unprotected' from the damage of iodine deficiency. Inadequate thyroid function in the foetus and newborn is the likely cause of brain damage in iodine deficiency. Controlled trials of iodine supplementation in mild-to-moderately iodine-deficient pregnant women improve maternal and newborn serum thyroglobulin and thyroid volume, but do not appear to affect maternal or newborn thyroid hormone levels. There are no long-term data on the effect of iodine supplementation in mild-to-moderate iodine deficiency on birth outcomes or infant development. Moreover, assessment of iodine status in pregnancy and infancy is challenging and there are currently no well-established, evidence-based indicators for monitoring iodine status in these groups. The researchers want to determine whether the daily oral administration of 150 µg iodine to pregnant women with mild-to-moderate iodine deficiency improves maternal and newborn thyroid function, pregnancy outcome, birth weight, infant growth and cognitive performance.

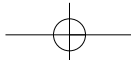
NUTRITION DURING PREGNANCY

Effect of tempe and vitamin-C-rich fruit supplementation during pregnancy on iron status and pregnancy outcomes

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Despite a national iron supplementation programme in Indonesia, anaemia is still a major public health problem among pregnant women. To combat iron deficiency, increasing the consumption of iron-rich foods and improving the bioavailability is the most sustainable intervention in the long term. In Indonesia, good-tasting, inexpensive iron-rich foods or foods which increase the bioavailability of iron are available – these include tempe (fermented soybean), vitamin-C-rich fruits and dried small fish –, but they are not used as much as they could be. Some reasons are perception, food habits, and the lack of scientific information on the effect of these foods on the iron status. Therefore it is planned to do a trial with daily supplementary food consisting of tempe, vitamin-C-rich fruit and small amounts of meat to get a maximum increase of the iron intake without significantly increasing the cost of the diet. Pregnant women (n=250) will be recruited from tea plantations where the prevalence of hookworm infection is greater than 20% and will be randomly allocated on the village level into supplementary food and control groups. Intervention will begin at 12 to 16 weeks of gestation and continue until delivery, and be integrated with monthly hygiene and nutrition education. The primary outcome is the maternal iron status. Secondary outcomes will be infectious status, weight gain, gestational age, birth weight, delivery complications and foetal loss.





SENEGAL

Institutional support for the Nutrition Unit of the Faculty of Sciences, University Cheikh Anta Diop in Dakar (Senegal) has been a rather long tradition. Prof. Salimata Wade organised a five-day course entitled "Regional training course on human nutrition" about the nutritional rehabilitation of severely malnourished children. The Foundation gave a grant to the organisers to sponsor the attendance of seven local participants or participants from other French-speaking African countries.

SENEGAL



One of the major aims of the Nestlé Foundation is the transfer of sustainable knowledge to low-income countries and capacity building in general. Again during 2007 several endeavours in this area were undertaken.

INSTITUTIONAL SUPPORT

MALAWI

Based on a research application to test the efficiency of a fortified peanut-based spread in children for malnutrition in the Mangochi Child Nutrition Intervention Study, a fellowship was given to two students from the Division of Community Health of the College of Medicine at the University of Malawi to complete their nutrition education at the Department of International Health at the University of Tampere Medical School in Tampere (Finland). Upon completion of their studies in Finland the two students will return to Malawi and strengthen the theoretical and practical capacity in the field of nutrition research at the College of Medicine in Mangochi (Malawi).

BENIN

The Faculty of Agricultural Sciences at the Université d'Abomey-Calavi, in Cotonou (Benin), has, since 1992, organised a course in nutrition and agriculture, by now familiar to many as the "FINSA course". FINSA stands for "Formation Internationale en Nutrition et Sciences Alimentaires". The FINSA course is one of the few annual courses in Africa which are held in the French language. The Foundation decided to support five students for the two-week FINSA course and one student for the four-week FINSA course. These students came from Cameroon, Ivory Coast, Niger, Togo and the Comoros. The support of the FINSA course leads to capacity building in nutritional science and research in French-speaking Africa. In addition, the FINSA course strengthens the local capacity of the Department of Human Nutrition, headed by Prof. Romain Dossa, who is also one of the main organisers of the FINSA course.



AFRICAN NUTRITION LEADERSHIP PROGRAMME

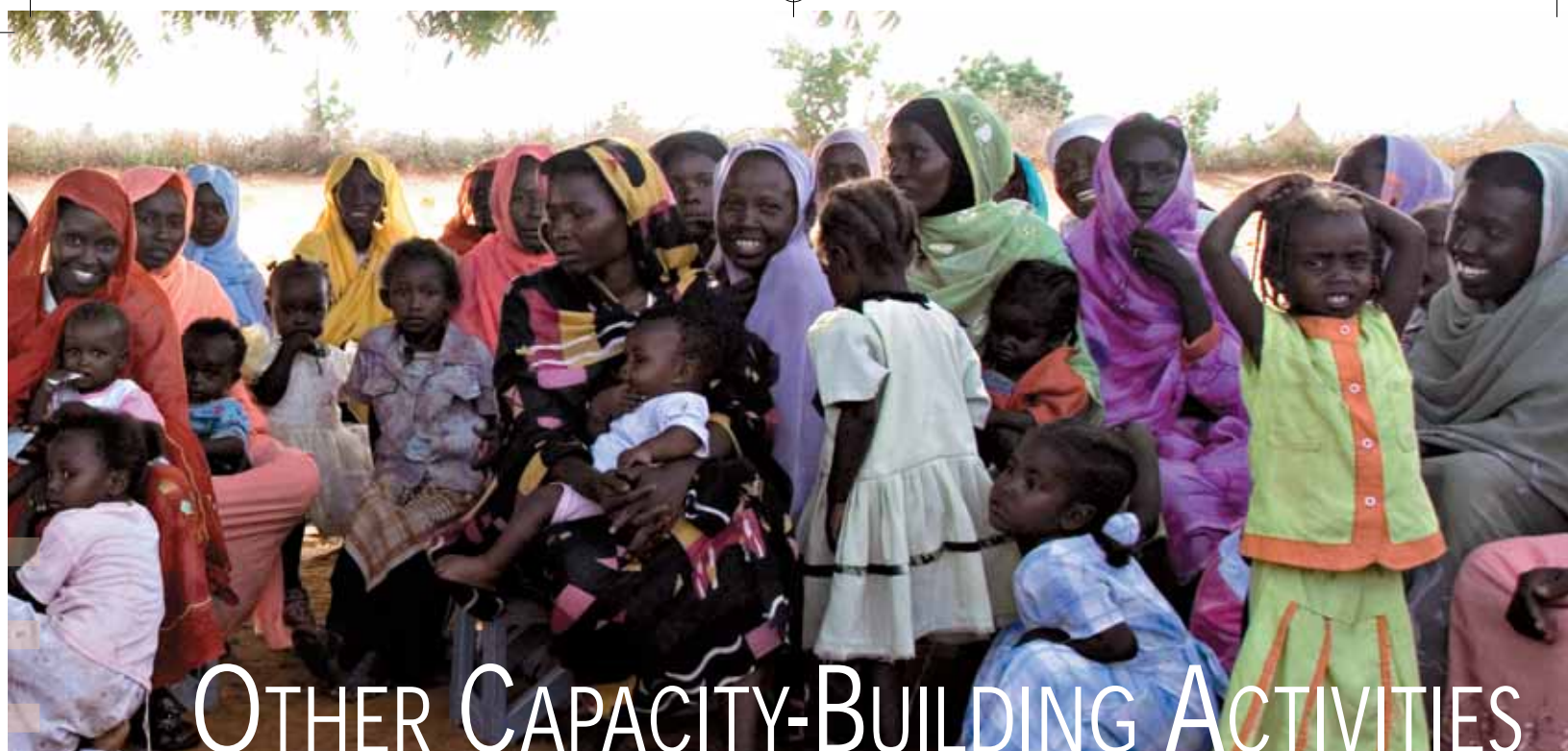
The African Nutrition Leadership Programme (ANLP) is a leadership development and networking seminar in the field of human nutrition in Africa. The ANLP concept is based on activities initiated by the Food & Nutrition Programme of the United Nations University (UNU-FNP) and the International Union of Nutritional Sciences (IUNS). Every year a one-week leadership programme is held at the University of Potchefstroom (South Africa). The Foundation supports this programme and yearly event with an annual contribution of USD 9,600.

SOUTH EAST ASIA NUTRITION LEADERSHIP PROGRAMME

For several nutrition researchers from Iran travel fees were paid, allowing them to attend this year's South East Asia Nutrition Leadership Programme (SEA-NLP). The SEA-NLP is organized by the SEAMEO TROPMED (Indonesia).

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>). Hon. Prof. Ruth Oniang'o, editor in chief, thinks that there is hope for Africa. Despite the grim television pictures of starvation and human suffering, there is tremendous hope for a continent whose people are its greatest resource. 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 contribution of USD 2,000 for each issue of the journal. Due to the high printing cost the journal is no longer available in a print version but only as a web-based publication. Despite being available only in digital form, the AJFAND is widely appreciated and is continuously improving. The submission of original articles and other contributions can only be encouraged.



OTHER CAPACITY-BUILDING ACTIVITIES



THE ORANGE enLINK TRUNK LIBRARY

The orange enLINK trunk was offered to 13 different nutrition institutions in 13 countries (see page 15). 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 represents actually the foundation on which a nutrition library will be built. At present the orange enLINK trunk is offered free of charge to different institutions in low-income countries.

THE FOOD AND NUTRITION BULLETIN

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). 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 the subscription for 400 individuals in low-income countries.



This year's VISON 2007 section focuses on different aspects for the reduction of malnutrition and improved health and well being: Dr. Diouf addresses the concept of ready-to-use therapeutic foods (RUTF) for malnourished children. RUTF has a high potential since it can be produced locally and it addresses the issue of energy.

The former Chargé d'affaires a.i. of the Swiss Embassy in Sudan, Mrs. Andrea Reichlin, discusses issues around higher education and the practice of science in the developing world using the case of Sudan. The complexity of education and strategies for improvement are critically discussed. Dr. Christine Hotz discusses the potential of biofortification to reduce malnutrition, a still-underutilized strategy to combat micronutrient

malnutrition. Our Council member Prof. Jehan-François Desjeux emphasises that the ideal way to get all essential nutrients is by normal food. With all the efforts to reduce malnutrition, it should not be forgotten that single nutrients cannot be equated with food. Strategies to address malnutrition should focus on food-culture interactions. Once more enLINK-ing is the crucial issue!



VISION 2007

SELF-EMPOWERMENT

READY-TO-USE THERAPEUTIC FOOD (RUTF)

BIOFORTIFICATION

ABOUT NUTRIENTS AND FOOD



SELF-EMPOWERMENT

OBSERVATIONS ON HIGHER EDUCATION AND THE PRACTICE OF SCIENCE IN A DEVELOPING COUNTRY: THE CASE OF SUDAN

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Practicing international relations in a country like Sudan is a multifaceted challenge. The needs are complex and a generalist must familiarise him- or

herself with a number of subjects in an attempt to understand the working environment. Higher education and research are markers within a given political system, society and culture. In particular they can give excellent hints on a government's priorities in public and development policies and they illustrate the government's vision of its elite and institutions. My experience in Sudan indicates that research and higher education are first and foremost embedded in a cultural context. Changing existing patterns will take considerable time, but the facilitation of access to scientific publications and

literature could give a fresh impetus to communities where knowledge remains a privilege for only a few.

Vision versus means?

Governments in developing countries are well aware of the fact that higher education is the natural gateway for their future leaders. Efforts to allocate funds to this sector are generally uncontroversial in parliamentary and public debates. However, in the case of Sudan, the spending per student remains, even in absolute terms, at a very modest level.

During the last two decades, the development of higher education and research was severely affected by complex emergencies becoming permanent. This situation ended formally with the signing of the North-South Peace Agreement in 2005, the adoption of an Interim Constitution and the formation of the National Unity Government, which enlarged the power-sharing basis from the Northern ruling party to a coalition including the majority party from the South. But the ongoing conflict in Darfur has, in many ways, affected the opportunities of a new era in research and higher education.

At the time of independence, in 1956, Gordon Medical College and the Faculty of Law in Khartoum, as well as other public institutions, operated at internationally recognised standards with close links to the most prestigious establishments in the UK. The economic and funding decline for higher education in the 1970s, combined with the strategy of the Islamic Front (NIF) to control the student unions and to utilise higher education as a recruitment ground, led to a steady decline. Shortly after the coup by the Islamic Salvation Revolution in 1989, Arabic became the language of instruction, replacing the English curricula and translation practices and banning English textbooks. This decision narrowed perspectives for students from ethnically diverse backgrounds whose command of Arabic was poor. The number of public universities rose from five in the 1990s to 26 in the year 2000 and the intake of students jumped from 6,000 to almost 40,000. However, budget spending increased insignificantly. By 2000, the participation of female students rose to 60% of total enrolment but without similar tendencies at the faculty and staff level. Political control and pressure on academics and the increasing isolation of the country from the international mainstream led to a massive brain drain.

The demographic challenge and the expansion of the university system were not balanced by corrections in the access conditions or the

improvement of educational opportunities at the secondary or primary level, on the contrary. The Islamic Front stuck to its concept of mass education but without the financial and intellectual means (teachers) to accomplish this ambition. In the absence of quality control, mass diplomas replaced the once high-standard qualification system. This policy leads to a mismatch in the labour market outside the scientific realm. Up to now, there remains a question mark on the number of graduates employed. In addition, science and the economy will have to absorb a further drain of well-trained professionals in the near future due to retirement.

Despite revised policy objectives and slight spending increases in a number of sectors under the National Unity Government, the translation of those objectives into higher education and research remains weak. Effective implementation policies are mostly lacking. The demographic pressure remains unaddressed, research activities are seldom prioritised, the networking between institutions is poor, and the flexibility for fundraising and partnership with third parties is limited by bureaucratic complexity or bilateral sanctions. Occasionally, nostalgic ideas of exerting political control over the diffusion of knowledge reappear and become an additional hamper to reform. The ranking education professionals, appointed by political commitment rather than academic distinction, remain partly in place. To sum up this non-exhaustive catalogue of factors pre-conditioning research activities in Sudan, the "hard" elements like the amount of funding available might play an equally critical role when it comes to outputs like deficiencies in management and implementation practices and the intellectual isolation of the country for at least two decades. Vision, undoubtedly a central element in such a strategic activity, remains, therefore, in a vacuum.

Cultural elements and the culture to practice science

As in many regions of the Southern hemisphere, academic background is highly valued in Sudan. Education is not free. The government counts on self-reliance and community efforts. Academic distinction is therefore linked to social status. Within a given community, people with university degrees almost naturally become leaders and spokespeople for individual and group interests. Educated men sometimes become a challenge to traditional leaders selected by affiliation only. Education and especially a higher degree leads to a huge gain in authority within society but is also linked to an obligation of advocacy for a given group. In

addition, academics are given more opportunities for contact with the outside world.

The galloping urbanisation and changing lifestyle has altered the service expectation of a large population. But changing lifestyle does not forcibly go hand in hand with alterations in the system of values. Equality between men and women for instance is, in principle, acknowledged by the majority, but constraints by tradition and religion remain largely in place. Consequently, the opportunities and behavioural codes are distinguished clearly between the sexes, with no exception for members of the scientific community. The freedom of movement for field work within the same discipline varies considerably between men and women.

The cultural understanding of authority plays a central role among the sociological factors which impact on the diffusion of knowledge and the way science is practiced in Sudan. Authority is hardly challenged and a critical approach towards content is understood as defiance towards the person diffusing it. Because of the high social status and position of authority held by academics, students tend to reproduce knowledge rather than question content. In some cases, it appears that academics are reluctant to diffuse or broaden access to knowledge because they want to keep the comparative advantage and monopoly. At the same time, a general pattern of outsourcing or delegation to non-academics of manual activities and tasks considered lower ranked can be seen. Such decisions, once again emanating from a given cultural context, can be harmful to the understanding of the case and its time management.

Opening up the access and diffusion of knowledge to developing countries

Against this complex background changes can only happen gradually. Promoting access to adequate and up-to-date scientific information for students in Sudan and elsewhere in the developing world is a very important avenue for change. Access to the internet, as it exists in all major cities, by no means guarantees access to literature and state-of-the-art publications. These sources are protected by property rights and access codes out of range for many institutions and even more for the individual student in Sudan. The dissemination of content through information technology is too often a question of financial means and the provision of a credit card, etc.

The bilateral and gradually reinforced financial and economic sanctions of the US since the year 1997

have presumably had an important effect on research and higher education. The non-eligibility of students for American scholarship programmes and the embargo prohibiting partnership agreements with American research societies has at least partly hindered knowledge transfer in the past and affected efforts to upgrade since 2005. As an embargoed country, the access to the JSTOR library also remained limited until very recently. At stake is not only the problem of access, but, of equal importance, also the chance to edit information and research emanating from developing countries. Reading any specialised review, one immediately understands that the circle of authors is very much limited to specific geographic zones. The global scientific community cannot afford to exclude knowledge from any of its members. It is my understanding that a number of universities in Europe, Canada and the Pacific, as well as private institutions, have established partnership agreements with research institutes in developing countries to promote inter alia access to literature, books and reviews in specialised fields. Such initiatives are very encouraging. If such agreements are combined with coaching in the methodology and design of research, such efforts are even more promising. However, for the time being, the scope and impact of these efforts, in Sudan and elsewhere, remain too limited. Therefore, awareness must be raised and urgent action taken, especially in developed countries.





READY-TO-USE THERAPEUTIC FOOD (RUTF)

USE OF RUTF (A READY-TO-USE THERAPEUTIC FOOD) IN THE REHABILITATION OF CHILD AND ADULT SEVERE MALNUTRITION IN SENEGAL

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The World Health Organization has clearly defined the basis of inpatient rehabilitation of severely

malnourished children and adults (10) using milk formula fortified with vitamins and minerals (F100). This protocol, although effective, presents practical difficulties in developing countries when home-based or community-based rehabilitation are concerned. A dry, solid, ready-to-use food, equivalent to F100 (RUTF), has been proposed to overcome the risk of bacterial contamination from added water to F100 (3). RUTF is obtained by replacing part of the dried skim milk used in F100 formula with peanut butter; hence RUTF has an energy density that is five times greater than that of F100, but it has a similar ratio of nutrients to energy

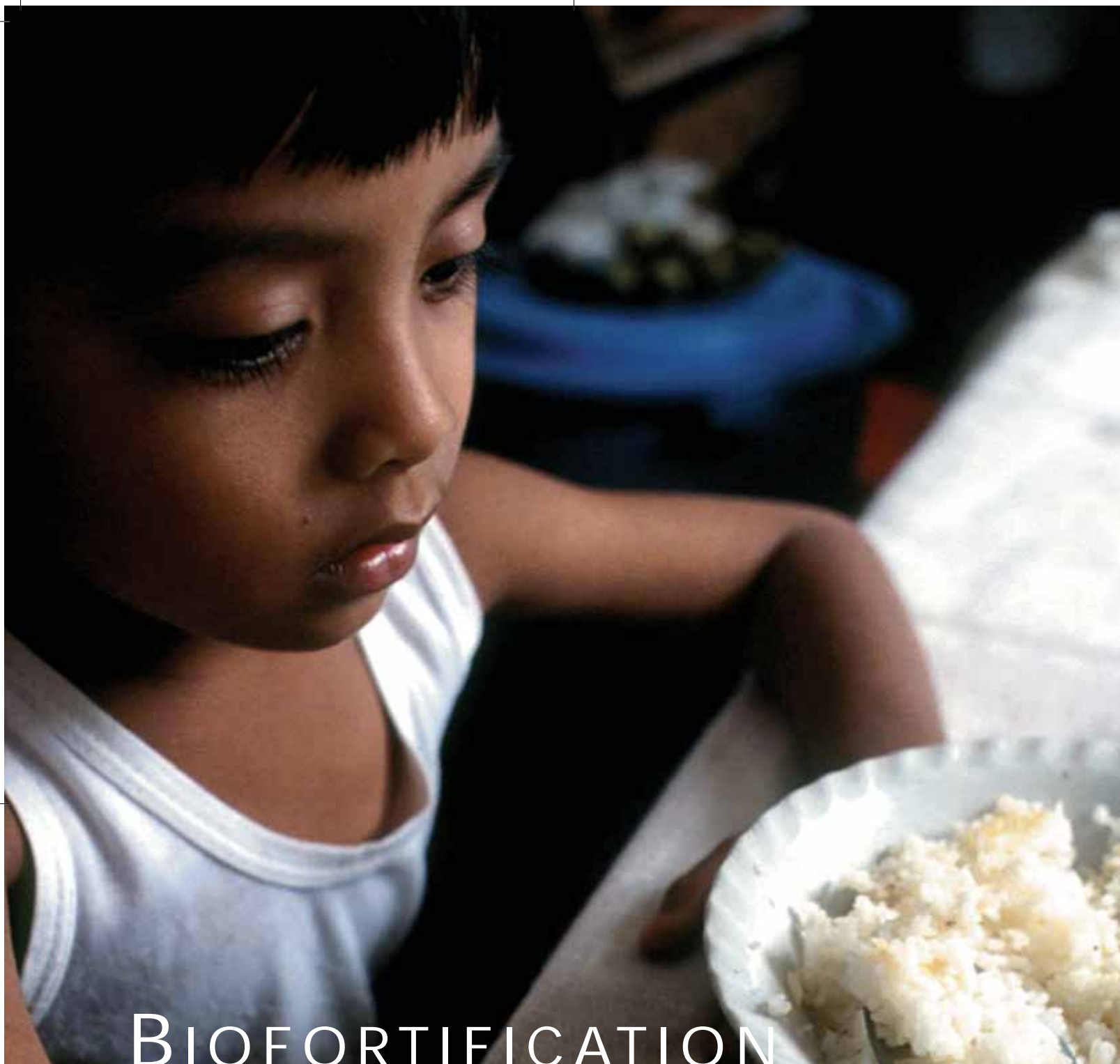
as F100. It can be prepared locally or industrially as recently described (9).

The efficacy of RUTF versus F100 for the rehabilitation of severely malnourished children was first tested in Senegal by the nutrition staff of the Laboratoire de Nutrition at the University of Dakar, thanks to the financial support of a grant from the Nestlé Foundation. The results have shown that RUTF can be used efficiently for the rehabilitation of severely malnourished Senegalese children. The rate of weight gain was 15.6 g/kg/day for the children receiving RUTF versus 10.1 g/kg/day for those receiving F100 ($p < 0.001$) (6). The weight gain was mainly fat-free mass in both groups (7, 11).

Following these results, RUTF was prepared locally and tested for its acceptability and efficacy against the industrial preparation. Locally made RUTF was as well accepted as the imported version and led to similar weight gain as the imported version during home rehabilitation (8, 5). In the Tendeng study, a double-blind randomized trial was also carried out in 55 children aged 6 to 59 months, just recovered from an episode of severe malnutrition, and still anaemic ($Hb < 110$ g/L). The children were divided into two groups, one receiving daily 30 g of the locally made spread (similar to RUTF except for micronutrients) enriched with 25 mg iron (sulphate), 100 µg folic acid, 53 mg vitamin C and 2 tablets of placebo, and the other group receiving daily 30 g of this spread enriched with 53 mg vitamin C and 2 tablets of 25 mg iron and 100 µg folic acid. The study showed that, after two months, iron fortification significantly improved the iron status of the children recovering from acute severe malnutrition (5).

The ability of local RUTF supplement to improve body composition was also tested in adult malnourished HIV/AIDS patients. For six months, the patients received 43 g RUTF each day, mixed with porridge made from millet. The preparation as such was 100% accepted by the patients, even those with oral candidiasis. After three and six months 50% of the patients gained weight ($Wt = +1.9$ kg and $+1.8$ kg, respectively). The weight gain was mainly lean mass whatever the period (fat-free mass, $p < 0.05$ and body cell mass, $p < 0.01$ compared to baseline values). Weight loss in the remaining 50% subjects was only fat ($Wt = -1.2$ kg and -0.9 kg at 3 and 6 months, respectively) and no change was observed in the fat-free mass component. The lymphocytes CD4 were unchanged during the entire study period. These preliminary results suggested that locally produced RUTF might be a potential tool for the rehabilitation of adult malnutrition. In conclusion: The efficacy of local RUTF in the management of child malnutrition is now well demonstrated in Senegal, but a protocol still needs to be validated for adults. The forthcoming challenge will be to convince the Ministry of Health

to integrate RUTF in the national guidelines for home or community-based treatment of severe acute malnutrition. As part of this challenge, the Laboratoire de Nutrition at the University of Dakar recently organised a five-day residential training course on "Nutritional rehabilitation and body composition of children suffering from severe acute malnutrition (SAM)". The training was partially funded by the Nestlé Foundation. The main objective of the course was to train personnel working in medical and public health sectors to adequately rehabilitate, evaluate and follow up on children suffering from SAM. The participation of the nutrition staff of the Senegalese Ministry of Health and Prevention has been very appreciated.



AN AGRICULTURAL STRATEGY TO CONTRIBUTE TO IMPROVED MICRONUTRIENT ADEQUACY AMONG POOR, RURAL POPULATIONS

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Micronutrient deficiencies are among the major causes of poor health and child development among low-income populations and, in large part,

may be attributable to the limited nutritional quality of the food supply available to the poor. In several developing countries, strategies such as food fortification and provision of micronutrient supplements are being implemented with varying degrees of coverage. An additional, and complementary, approach to improving the intake of critical micronutrients is to increase natural micronutrient content in the foods already being consumed by those at risk. One way this can be accomplished is by breeding food crops that are naturally rich in critical micronutrients. The focus of the biofortification strategy is to

increase the adequacy of micronutrient intakes among rural, agriculturally based populations that already produce and consume the staple food vehicle. As is the case for universal staple food fortification, biofortification is intended to contribute to the prevention of micronutrient deficiencies, reaching all household members. Unlike traditional fortification, biofortification does not require that the food vehicle be centrally processed. Therefore, this strategy has the potential to fill the gap in coverage left by fortification, as it can be more accessible to those who consume staple foods from local or self-production, especially in underserved rural populations.

HarvestPlus is a Challenge Programme of the Consultative Group on International Agricultural Research (CGIAR) that undertakes to design, develop, evaluate and disseminate staple food crops that are biofortified with iron, zinc and provitamin A. These are micronutrients widely recognized by the World Health Organization as being among the most limiting in diets.

Under the agricultural component of HarvestPlus, progress in breeding for biofortified staple food crops has been promising, with nutritionally relevant increases in the content of iron and/or zinc being achieved in maize, rice, wheat, beans and pearl millet, and of pro-vitamin A in crops such as maize, sweet potato and cassava. The research presently being addressed by nutritionists is to demonstrate the ability of biofortified crops to have a positive impact on the nutritional and health status of target populations.

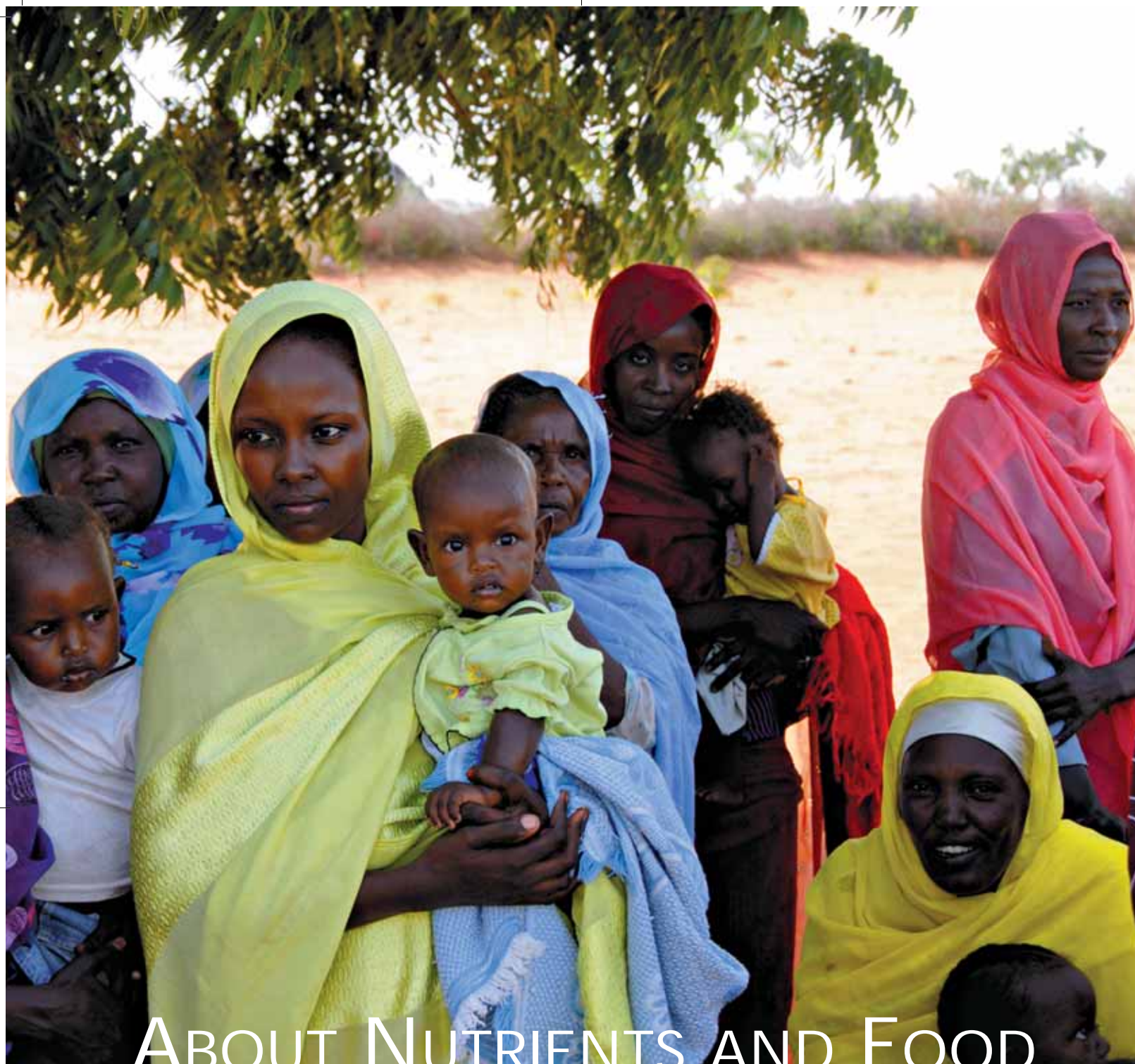
Nutrition research conducted to date on biofortified crops has yielded positive results. For example, iron biofortified rice was shown to increase the iron stores of iron-deficient Filipino women. Beta-carotene-rich sweet potato has also been demonstrated in several controlled efficacy studies to improve vitamin A stores in children. More recently, an effectiveness study demonstrated that a multidisciplinary programme to introduce orange-fleshed sweet potato as an agricultural crop in Mozambique resulted in improved vitamin A status among young children. Further studies on other micronutrient enhanced crops are currently being designed.

Complementary research on other micronutrient enhanced crops is also being conducted. For example, an animal study indicated that the retinol equivalency of provitamin-A-rich maize was very favourable, making maize a potentially excellent vehicle for delivering a regular source of provitamin A. Other studies also indicate that the retention of provitamin A in maize following various traditional African processing and cooking methods was good

(i.e. >65%). The bioavailability of iron and zinc from staple food crops is also being determined to ensure that the additional amounts of nutrients added can be sufficiently well absorbed.

To become a successful micronutrient intervention strategy, programmes will need to address several issues over and above the nutritional impact. Successful local breeding programmes are needed to adapt biofortified varieties to local conditions and ensure they also bear other agronomically important traits desired by farmers, such as high yield, pest and disease resistance and drought tolerance. Mechanisms to disseminate the nutritionally improved planting materials also need to be in place. Market development, demand creation and nutrition education are also required to achieve adequate consumer acceptance and adoption of these new varieties. All of these components are currently being addressed through research.

Ours is a food-based strategy that holds great potential for contributing to improved micronutrient intakes across broad populations who depend so much on cereals, roots and tubers as their primary source of energy. What's more, the implementation of this strategy has the potential to unleash the power of agriculture to address nutritional problems. Plant breeding is thus providing a viable means through which nutritional status can be improved – by improving the nutritional quality of the food supply itself.



ABOUT NUTRIENTS AND FOOD

FROM NUTRIENT REQUIREMENTS TO EATING LOCALLY AVAILABLE FOODS

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From the beginning of humanity, nutrition has been an essential and intense activity of research. It is not difficult to imagine that quantity and safety were the first two major issues. Obtaining enough food was, and still is, the main concern of most people, from hunting, fishing, and fruit and leaf collection, to, since approximately 5,000 years ago, the harvesting of grain. Many populations are still grappling with the problem of hunger. Over time, the quantity of food increased at the expense of the quality of the

diet, particularly in terms of micronutrient content. In the meantime, the safety issue was raised with the introduction of new foods. It is hard to imagine that wild legumes, vegetables, fruits or animal milk were accepted for human consumption without fear. Prayer to the divinity was a precious tool.

Nutrition entered the field of contemporary science during the fifth and fourth centuries BCE in ancient Greece. During that extraordinary period of humanity, it became obvious that divine intervention in all matters could not be the most rational explanation for the functioning of the world.

Aristotle (384-322 BCE), who was a student of Plato and teacher of Alexander the Great, described the cycle of water to explain the rain. The concept of a cycle as a self-regulatory mechanism was used much later, in 1649, by William Harvey to explain blood circulation and then in many biological systems, including the infamous Krebs cycle. In the same line, the founding father of medicine and nutrition, Hippocrates, who was born one century before Aristotle, started to explain health and diseases by physical mechanisms. He did not exclude divine intervention – his family was of half-divine origin! – but before understanding an epidemic, he first looked at the direction of the winds crossing an area of stagnant water and blowing its miasmas toward the city. He spent much time understanding health and diseases through eating habits: one or two meals a day, balanced food consumption, and the need for physical activity. To sum up, he made a major breakthrough in human history by taking humans as an object of discovery.

Although the reference to Hippocrates was not always explicit, we can trace his basic approach through the contemporary history of nutrition research. At the end of the eighteenth century, Lavoisier, after making superb calorimetric measurements in animals and humans, could sum up: "Life is a chemical reaction". Along the same lines, during the nineteenth and twentieth centuries, nutrients were defined as chemical substances which are present in the food we eat. They include proteins, fat, carbohydrates, vitamins and minerals. They bring energy through oxidation of the main constituents. In the second half of the twentieth century, research was oriented towards trying to define the amounts of selected nutrients considered adequate to meet people's known nutrient needs. As a result, many countries and international organisations have presented evidence-based recommendations for, or reasonable limits on, specific nutrient intake in the general population, considering different ages and specific needs (such as for pregnant and lactating women), as well as diseases and particular conditions. For example, they recommend how much energy, protein, vitamins and minerals children should eat to remain healthy and grow well (FAO/WHO 2004).

The new challenge would be to pursue such a scientific approach to feeding populations with foods. The question is to try to reconcile the nutritional recommendations with the food basket brought home by the mother, which contains some combination of foods classified as cereals, legumes (pulses), nuts and oilseeds, vegetables, fruits, milk and milk products and flesh foods (fish, meat and poultry). Even for professionals, including nutritionists responsible for feeding communities, determining if the provided food corresponds to

nutritional recommendations is not always a straightforward process. Therefore mothers rely on other criteria that do not explicitly take into account the nutrient composition. Rather they rely on local availability, cost and possibly acceptability at home. They may also link food intake with health status.

Even in countries where food companies provide specific products at affordable prices, the challenge is to establish food-based dietary guidelines for all ages of life with locally available food. One good example is the recent approach of complementary feeding in children.

The framework of such research activity is somewhat different from the stereotypical laboratory activities in biomedical research. In that context, the starting point would generally be an observation that health status or behaviour in a specific population could be related to nutritional status. I selected a few typical examples in the projects submitted to the Nestlé Foundation: "Complementary feeding in the semiarid areas is a problematic issue with early introduction of poor quality complementary foods, mainly thin low-energy maize porridge"; "Weaning foods given to the children are predominantly cereal-based and deficient in calcium"; "Changes in dietetic and in lifestyle patterns have been contributing to chronic diseases"; "Malnutrition occurs in poor families with low levels of education"; "In children with severe malnutrition the risk of death is increased by enteric infection"; "Our country is endowed with abundant natural and human resources and, at the national level, produces enough food to adequately feed its population. However, despite all the above, childhood malnutrition is a significant public health problem affecting more than one third of the children under the age of five"; "Although many intervention programmes have been carried out, anaemia prevalence remains high among schoolchildren in the region"; "In our country, the prevalence of low birth weight is very high and half the childbearing women are suffering from malnutrition".

Obviously, these observations raise issues far beyond nutrition, including geo-politics, climate and socio-cultural context. In other words, the nutrient approach falls short of solving the food-based answer. Thus, a new scientific step needs to be proposed. One possibility would be to take into account acceptable limits or constraints; after all, the mothers already know the limits of the local market food availability and its cost. To be pragmatic, the nutritionist could add another limit, the nutrient limit, expressed as Recommended Dietary Allowance (RDA), or other validated nutrient-based referenced values. So far those limits are usually studied through a "trial and error"

approach. However, similar complex situations have long been studied in biological systems, including agricultural research using linear programming. Examples could be found in optimizing the use of fertilizers or animal feed to help farmers make sound economical decisions. Such an approach is also of interest in human nutrition. In essence, the programme takes into account the limits of food availability and cost, and “sees” if it could fulfil the recommended dietary allowances for a specific population. For example, the computer programme called “NutriSurvey”, available at no cost (<http://www.nutrisurvey.de/lp/lp.htm>), examines the feasibility of whether a food-based approach will fall within reasonable limits. In addition, it provides a quantitative analysis of the situation. To take a simple example, it is clear that a source of calcium should be added to cereal-based weaning food; NutriSurvey can estimate the amount of dairy product needed, or possibly other sources of calcium. Such an approach could be used to analyse a priori the relevance of formulating a specific food, or initiating an intervention or educational programme. In addition, the linear programming approach can suggest useless food: For example, a recent American study concluded that added sugars should be discouraged in dietary guidelines, because their adverse effects on diet quality were evident in this low-income population. To sum up, NutriSurvey is an interesting tool that could be used by nutritionists in a friendly manner to avoid expensive and sometimes useless trial and error studies. The data required for the models include a list of foods consumed by the target population, and then, for each food, its minimum portion (0, for most foods), its average-sized daily portion (g/d), its maximum weekly portion (g/wk), its cost per gram, its food group category, and its energy and nutrient content. It cannot fully solve the questions listed above, but it can help in predicting if a research project is correctly designed to answer the questions. It may also point to specific quantitative issues, such as a deficit in iron or zinc or the expensive cost in the proposed diet (e.g., an undesirable negative deviation of 2 mg/d occurs when the optimized diet's iron content is 3 mg/d instead of a targeted 5 mg/d). It is probably useful to include it in a pilot study.

Linear programming is not a programme of nutrition; it is a superb mathematical method to consider limits or constraints. It was initially proposed at the end of the 1930s by professor Leonid Kantorovich (1975 Nobel Prize recipient), who was faced by a concrete planning problem: how to combine the available productive resources in a factory in such a way that production was maximized. He solved this problem by inventing a new type of analysis, later called linear programming. In nutrition as in other fields of

research, the answer strongly depends on the quality of the question. In the search for an appropriate food-based diet it is clear that the constraints choice and quality are essential. One constraint is food availability: Is it at home, in the village, in the country or in the world? Could it be improved by an agricultural approach? The money constraint needs to be appropriately evaluated in sound economic terms. Similarly, it is the responsibility of the nutritionist to select and fully understand the nutrient reference values. In principle, other constraints could be added, such as the volume and frequency of the meals, the level of physical activity and other factors influencing nutrient effects. An interesting example is presented in a recent study aiming at providing food-based dietary guidelines to combat micronutrient deficiencies in Malawian children. It promoted daily consumption of maize flour, small dry fish (>20 g), leaf relish, and two to three snacks, the latter including mangoes in the food-shortage season, and pumpkin in the food-plenty season. In addition, legume relish was recommended in the food-shortage season. The linear programming model is still under improvement.

Whatever the means to achieve a scientifically acceptable food-based diet, it has to be tested in real conditions. At the beginning, the nutritionist cannot provide what is not immediately available, affordable or acceptable. In other words, it is one thing to use the locally available food to obtain the best possible diet, and another to design a diet that covers all the needs at the optimal level. Obviously, the nutritionist has to set priorities. One of the most often forgotten is the energy requirement; it is unrealistic to look for an effect of a micronutrients complement if the target population does not receive the proper level of energy. Another commonly forgotten priority is that each nutrient is part of a matrix altering the overall nutrient or cost of the diet: Calcium is most often added in the form of dairy products and iron in meat or fish.

In designing a programme to improve complementary feeding or school meals, alter unhealthy feeding behaviour, correct iron-deficient anaemia or prevent malnutrition in a specific environment, the nutrient-based approach is required but should be enriched with different kinds of expertise to extend the success to more areas, e.g. agricultural counselling to improve the availability of food. To sum up, only surveys carried out after guidelines are implemented will be able to evaluate if the food-based recommendations are adequate and ensure a satisfactory nutrient intake, or if they are instead too complicated and cannot be remembered or implemented by families, or too simplified to provide adequate nutrient requirements.

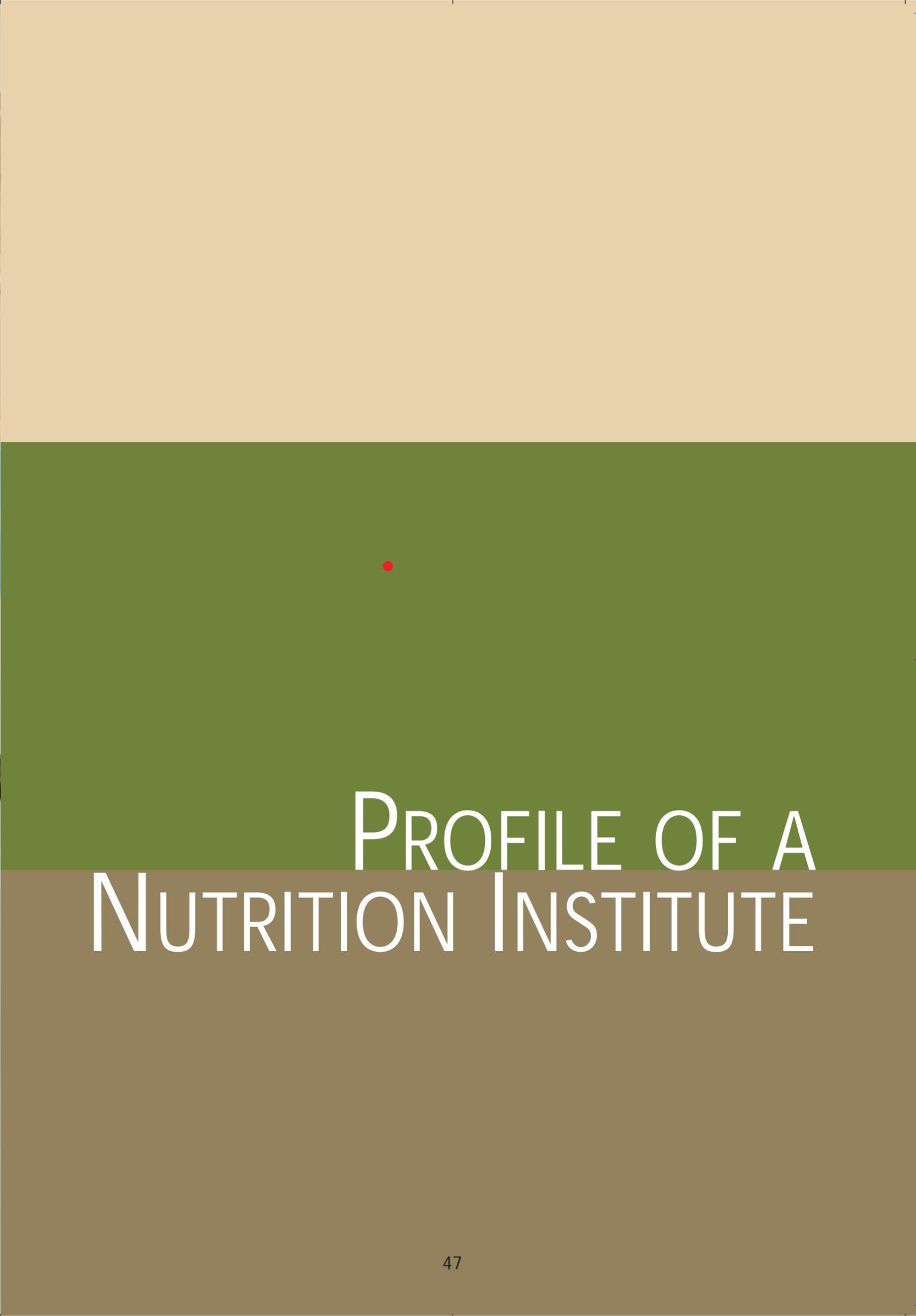
The cultural context is one oft-cited limit of success. Foods are not commonly recognized as a source of nutrients, yet the nutritionist aims at covering the nutrient needs. Such a discrepancy represents a typical gap produced by science. Twenty-five centuries later the Hippocratic proposition to take humans as an object of research is still a matter of debate. Three centuries later, the concept of life as a chemical reaction is still an object of doubt. After all, cooking rice every day at home is more effective in feeding the family than discussing the amount of vitamin B1 and fibre in the locally available rice. Such a gap is typically present when designing nutrition projects aiming at improving the nutritional status of a target population with locally available food. The answer to such a dilemma must be found in the improvement of health status and behaviour of the targeted population.

"One of the most often forgotten is the energy requirement; it is unrealistic to look for an effect of a micronutrients complement if the target population does not receive the proper level of energy."

Jehan-François Desjeux, M.D.







PROFILE OF A
NUTRITION INSTITUTE



NUTRITION CENTRE FOR TRAINING AND RESEARCH AT AHFAD UNIVERSITY FOR WOMEN

Osama A. Salih, PhD

Director

Nutrition Centre for Training and Research (NCTR)
Ahfad University for Women
Omdurman, Sudan

Ahfad University for Women (AUW) is a non-governmental and non-for-profit university established in 1966 in Omdurman, across the Nile from Khartoum. The history of AUW dates back to 1907 when Sheik Babiker Bedri established Sudan's first private girls' school for his thirteen daughters as well as other girls. Since the very beginning the school was for girls only! Currently AUW has over 5,000 undergraduate and 140 postgraduate students from all parts of Sudan and from neighbouring countries, such as Eritrea. AUW has 221 faculty members and more than 200 professors, associate professors, assistant professors, and lecturers. The goal of AUW is to prepare women to assume informed leadership roles in their families, communities, and the nation. In keeping with this objective, "the Ahfad experience" embraces a combination of well-articulated academic courses, on-the-job training, individual research, and community extension activities. This combination of activities is designed to prepare women from all parts of Sudan to become agents of change in their families and communities, and to assume leadership positions in the society. In Arabic, "Ahfad" means for "our grandchildren". This illustrates the important role which women have in the creation of a better future. Presently AUW offers a five-year bachelor's degree (BSc or BA) in six

undergraduate schools and a master's degree in two areas, one of them in Human Nutrition, which can be obtained at the Nutrition Centre for Training and Research (NCTR).

Since its establishment in 2001, the NCTR has had a clear vision of developing both the field of nutrition and nutritionists in the country. The main goal is to develop the leadership capacities and skills of the nutrition cadre (particularly female) through formal academic training (PhD, MS and Higher Diploma) in Human Nutrition and informal short-, medium- and long-term training programmes in the different areas of nutrition and related fields.

NCTR is the only institute of its kind in the country. It is affiliated with the School of Health Sciences at Ahfad University for Women, the pioneer in female education in the region, particularly in the field of Human Nutrition.

NCTR is proud to have on its faculty two of the fathers of nutrition science in Sudan: Professor A. H. Khatlab (an agricultural biochemist), the pioneer in introducing nutrition in general education and university curricula in Sudan, and Professor Y. B. Yousif (a gynaecologist), who first established the nutrition department in the Sudan Ministry of Health (1962). There are also other professors in different areas, including Food Microbiology, Physiology, Human Biology, Public Health, Community Medicine, Biochemistry and Food Science.

NCTR offers programmes for master's and PhD degrees in Human Nutrition. The programmes are concerned with the details of nutritional problems in Sudan and developing countries in general. However, the programme qualifies candidates who work in the fields of Agriculture, Health Education,

SUDAN

AREA

2,505,810 km2

AGRICULTURAL AREA

56%

ARABLE LANDS & PERMANENT CROPS

7%

PERMANENT CROPS

<1%

PERMANENT PASTURE

49%

POPULATION (estimated)

40 million

BELOW AGE 15:

18 million (47%)

POPULATION GROWTH RATE (2004)

2.64%

GNP (2004)

USD 530

LIFE EXPECTANCY

male: 56.96 years / female: 59.36 years

MORTALITY RATES (2007)

Neonatal Mortality Rate	41 / 1000 live births
Infant Mortality Rate	81 / 1000
Child Mortality Rate	34 / 1000
Under-Five Mortality Rate	112 / 1000
Maternal Mortality Ratio	1,107 / 100,000 live births

Infant and young child feeding

Exclusive breastfeeding rate (0-5 months)
33.7%

Timely complementary feeding rate (6-9 months)
55.8%

Adequately fed infants (Aged 0-11 months)
35%

Key nutritional anthropometry

Stunting in children under 5 years (2000)
43%

Wasting in children under 5 years (2000)
16%

Underweight in children under 5 years MDG1 (2000)
41%

Women with BMI<18.5 kg/m² (1995)
18%

Micronutrient deficiencies

Prevalence of goitre in school-age children (1997)
22%

Percentage of households consuming adequately
iodized salt (2000)
0.5%

Prevalence of clinical vitamin A deficiency in pre-
school children (1995)
3.0%

Prevalence of vitamin A supplementation in children
(2000)
44%

Prevalence of vitamin A supplementation in
mothers (2000)
22%

Other nutritional parameters

Percentage of households consuming adequate
iodized salt (15 ppm or more):
10.3%

Prevalence of anaemia in women of childbearing
age (Hb<12.0 g/dL)

Gezira	55.6%
Khartoum	20.8%
South Darfur	39.2%

Prevalence of anaemia in preschool children
(Hb < 11 g/dl)

Gezira	82.9%
Khartoum	32.0%
South Darfur	86.4%

Percent of mothers who received vitamin A supple-
ments within 2 months postpartum

Gezira	19.3%
Khartoum	45.5%
South Darfur	12.7%

Nutrition and Nutritional Policy, Agricultural Policy and Planning and Community Development Organizations. The training packages offered by the centre are mainly in the areas of nutrition in emergencies, public health nutrition, nutrition and food hygiene, elderly nutrition, anthropometry and dietary assessments.

The centre is involved in several nutrition projects and programmes at national and sub-national levels, including developing the first national nutrition policy for the country (2006); developing the manual for the management of severe malnutrition with the Ministry of Health; producing the nutrition country profile with the Food and Agriculture Organization (FAO); translating the handbook "Better Nutrition for Older People" with HelpAge International (HAI); and assessing the nutritional status of rural Arab countries with the Arab Organization for Agricultural Development (AOAD).

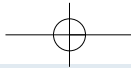
NCTR has established external links with the Feinstein International Famine Center at Tufts University (USA) and the Ethiopian Health and Nutrition Centre and recently (2007) with the Nestlé Foundation, in addition to other links with UN agencies such as UNFPA, UNICEF, UNDP, the Population Council, and international non-governmental organisations (including CARE International, MSF, and Save the Children).

The research policy at NCTR emphasises field-based community-oriented research. The key working areas of the centre are studies on food consumption patterns in Sudan, Sudanese food habits and taboos, nutrition in complex emergencies, nutrition strategy for old pastorals and community studies on micronutrients deficiencies.

The history of Ahfad University's engagement with nutrition science is much older than the history of the NCTR. Through the School of Family Sciences AUW was active in the field of nutrition for more than 30 years. Nearly 90% of the technical personnel and key persons in policy, planning and management in nutritional issues in Sudan have been drawn from Ahfad University graduates. The creation of the NCTR is the natural consequence of long-term leadership activities in the field of nutrition. Besides nutrition research, the postgraduate programmes in nutrition, and specific training programmes, the dissemination of nutrition knowledge is a key activity of the NCTR. Based on many studies done at AUW it has been recognised that the lack of knowledge or incomplete or even wrong nutrition knowledge represents one of the major causes for malnutrition and illness. AUW recognised already many years ago that only a

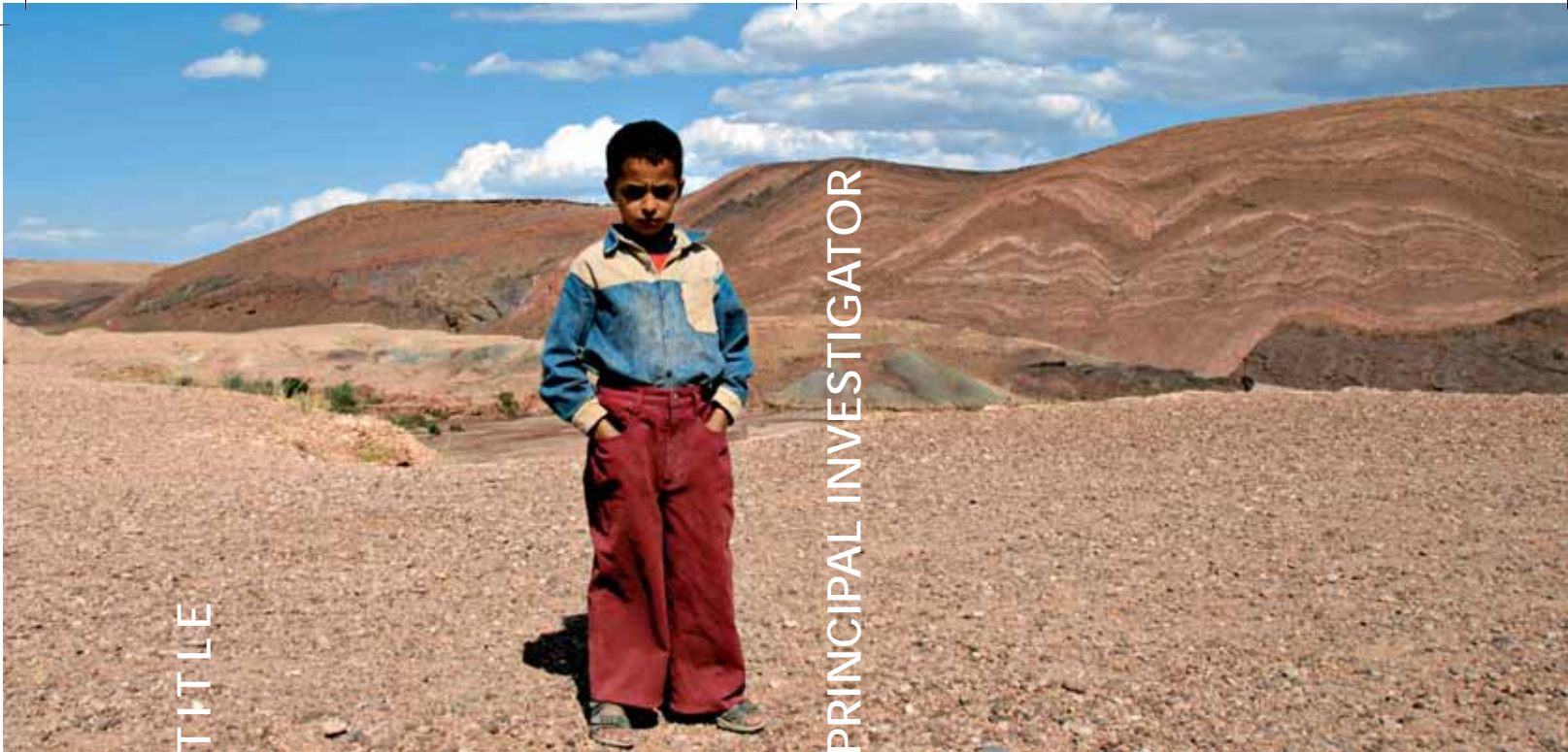
multidisciplinary approach (i.e. nutrition, medicine, agriculture) involving good knowledge in combination with practical work and experience will lead to sustainable improvement. Accordingly all students at AUW have to participate during their studies in a family attachment programme (FAP), during which the students learn to recognise and solve problems at the family level. Healthy families represent the basis for a healthy society. This approach underlines the central role of women in nutrition and health maintenance. Educating young women is the basis for better health and a better future.

Ahfad University for Women illustrates the endeavours to strengthen the position and voice of women in the society. Empowerment of women by a broad education including the key aspects of health and nutrition will lead to a better future characterised by health and happiness.









MICRONUTRIENTS

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 / Efficacy of multiple micronutrients supplementation in improving micronutrient status among anaemic adolescent girls in Bangladesh	Faruk Ahmed University of Queensland, School of Population Health, Brisbane, Australia
3	2002 / Effect of calcium supplementation to low-calcium-intake pregnant women on placental hemodynamic and fetal growth: A randomized clinical trial	Guillermo Carroli Centro Rosarino de Estudios Perinatales, Rosario, Argentina
4	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
5	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, USA
6	2003 / Effect of zinc supplementation and its interaction with vitamin A on child immune responses and morbidity rate	Martha I Kartasurya University of Queensland, School of Population Health, Brisbane, Australia
7	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
8	2003 / Zinc homeostasis in and zinc requirements of young Chinese children	Xiaoyang Sheng Shanghai Jiao Tong University, Department of Child and Adolescent Health, Shanghai, China
9	2004 / Effect of iron fortification of nursery complementary food on iron status of infants	Kim Su Huan Institute of Child Nutrition, Pyongyang, Democratic People's Republic of Korea
10	2004 / Effects of multi-vitamin and multi-mineral supplementation on pregnant women and their infants in Chongqing, China	Ting-Yu Li Chongqing University of Medical Sciences, Children's Hospital, Chongqing, China

MICRONUTRIENTS

11	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, Centre for Molecular Medicine and Drug Research, Karachi, Pakistan
12	2004 / Vitamin A value of spirulina carotenoids in humans	Guangwen Tang Tufts University, Human Nutrition Research Center on Aging, Boston, USA
13	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
14	2005 / Environmental supplementation of iodine by iodination of irrigation water in the Ferghana Valley	Maksuda Abidjanova Association of Endocrinologists, Kokand City, Uzbekistan
15	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 and Application, Hanoi, Vietnam
16	2006 / Vitamin A status of households according to the seasonal availability of vitamin A and beta-carotene rich foods	Romain Dossa University of Abomey-Calavi, Department of Food Sciences and Nutrition, Cotonou, Benin
17	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
18	2006 / Assessment of iron status of children in rural communities in Abia State, Nigeria	Ignatius Onimawo Michael Okpara University of Agriculture, Department of Human Nutrition and Dietetics, Umudike, Nigeria
19	2006 / Efficacy of multiple micronutrients supplementation on anaemia in rural Burkinabe children aged 6-23 months	Hermann Ouedraogo Inst. de Recherche en Sciences de la Santé, Ouagadougou, Burkina-Faso
20	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 and Clinical Research, Bangalore, India





21 2003 / Evaluation of two counselling 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

22 2001 / Oral rehydration solution containing amylase resistant starch in severely malnourished children with watery diarrhoea due to Vibrio cholera

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

23 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, Equipe de Nutrition,
Dakar, Senegal

BREASTFEEDING

REHABILITATION FROM
MALNUTRITION

INFANT AND CHILD
NUTRITION

24	2003 / Comparison of the efficacy and acceptability of three types of micronutrient supplements added to complementary foods for infants in Ghana	Anna Larrey University of Ghana, Department of Nutrition and Food Science, Legon, Ghana
25	2005 / Food-based approach for the control of stunting among preschool children	Chineze Agbon University of Agriculture, Department of Home Science and Management, Abeokuta, Nigeria
26	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 Dossa University of Abomey-Calavi, Department of Food Sciences and Nutrition, Cotonou, Benin
27	2006 / Promoting breastfeeding: A formative study among women and their husbands having infants aged 0-6 months in urban households	Judhiastuty Februhartanty University of Indonesia, SEAMEO-TROPMED RCCN, Jakarta, Indonesia
28	2007 / Mangochi Child Nutrition Intervention Study	Kenneth Maleta University of Malawi College of Medicine, Division of Community Health, Mangochi, Malawi
29	2007 / Potential of amaranth grain seeds to improve the nutrition and health status of school children	John Muyonga Makerere University, Department of Food Science and Technology, Kampala, Uganda
30	2007 / Improving nutritional status of children 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





MATERNAL NUTRITION

31 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

32 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-TROPMED RCCN, Jakarta, Indonesia

CHILD BEHAVIOURAL DEVELOPMENT

34 2001 / Cognitive performance of iron-deficient, non-anaemic Peruvian infants

Theodore Wachs
Purdue University, Department of Psychological Sciences, West Lafayette, USA

35 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

NUTRITION, IMMUNE
 DEFENSE AND INFECTION

36
 2002 / Nutrition assessment of children orphaned from HIV/AIDS

Judith A Ernst
 Indiana University, Indiana University School of Health and Rehabilitation Sciences, Indianapolis, USA

37
 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

38
 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

39
 2003 / Assessing physical activity of obese children by a clinical score

Claude Godard
 INTA, Unidad de Endocrinologia Infantil, Santiago, Chile

40
 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

41
 2007 / Diet, physical activity or environmental change: What are the key factors underlying the emerging child obesity epidemic in Ho Chi Minh City, Vietnam

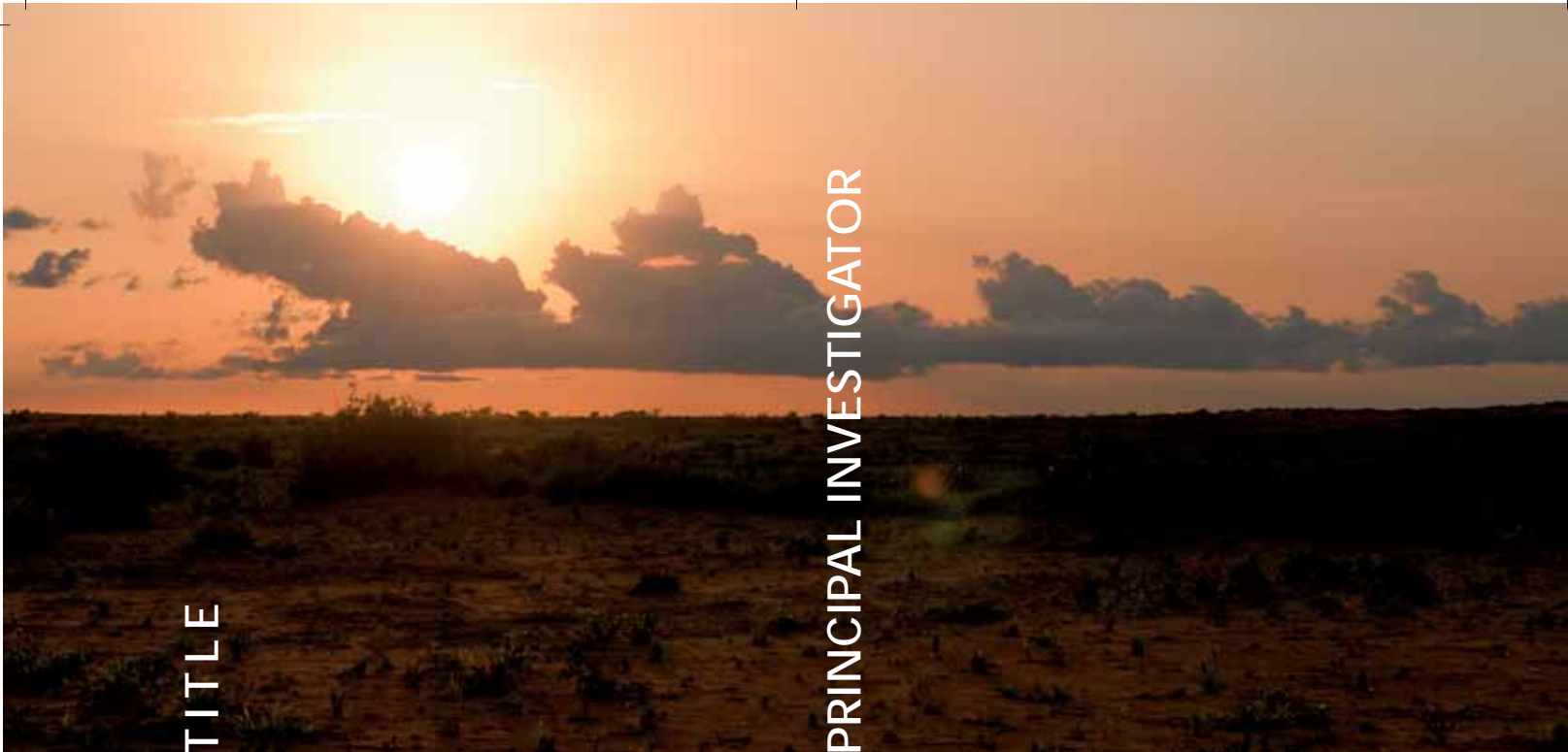
Hong K Tang
 Community Health Department, Training Centre for Health Care Professionals, Ho Chi Minh City, Vietnam

EPIDEMIOLOGIC
 TRANSITION



TITLE

PRINCIPAL INVESTIGATOR



TITLE

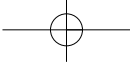
PRINCIPAL INVESTIGATOR

BONE HEALTH

42	2002 / Genetic, pubertal and nutritional determinants of peak bone mass accretion in adolescence	Heather Greenfield University of Sydney, Department of Animal Science, Sydney, Australia
43	2002 / Determinants of nutrition-related rickets in Chinese children and associated health outcomes	Mark A Strand University of Colorado, Health and Behavioral Sciences, Denver, USA
44	2003 / Heritability, nutrition and adolescent bone health	Ghada El-Hajj Fuleihan American University of Beirut, Calcium Metabolism and Osteoporosis Program, Beirut, Lebanon
45	2004 / Effects of parathyroid hormone on bone metabolism in older people in China	Bo Zhou Shenyang Medical College, Department of Preventive Medicine, Shenyang, China Nutrition interventions

NUTRITION INTERVENTIONS

46	2002 / Impact of vegetable gardening, fishpond and animal husbandry on household food security and nutritional status in some communes in Midland Vietnam	Phan Van Huan National Institute of Nutrition, Planning Department, Hanoi, Vietnam
47	2003 / School-based nutrition intervention pilot program	Dien N Le Nutrition Institute, Ho Chi Minh City, Vietnam
48	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

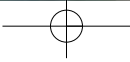
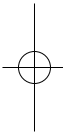
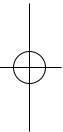
49 2006 / Application of learning technologies to support community-based lay health care workers and build capacity in chronic disease prevention in Thailand

Rhona M. Hanning
University of Waterloo, Department of Health Studies and Gerontology, Waterloo, Ontario, Canada

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Claudia Fortes Ferreira
Embrapa Mandioca e Fruticultura, Cruz das Almas - BA, Brazil

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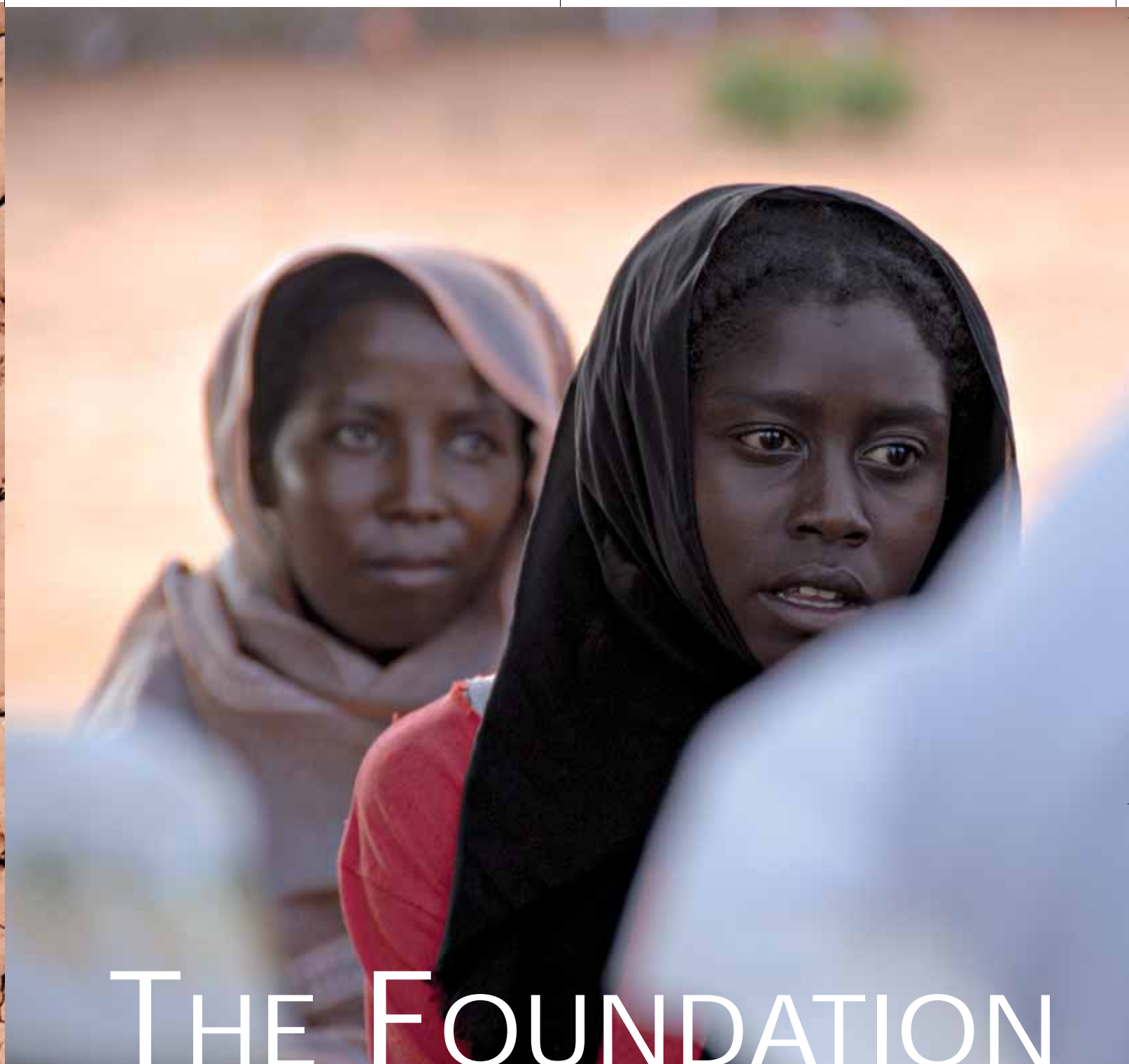
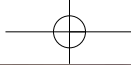
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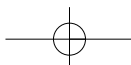
ORIGIN AND NATURE

The Nestlé Foundation for the Study of Problems of Nutrition in the World was established in 1966 by a donation of the Nestlé Company on the occasion of its centenary. The Foundation was self-constituting and formed a council consisting of five internationally well-known Council Members. The Foundation is financially and operationally independent of the Nestlé Company. The offices of the Nestlé Foundation are in Lausanne, Switzerland.

PURPOSE

The Nestlé Foundation initiates and supports research in human nutrition with public health relevance in low-income countries (see also <http://www.worldbank.org>). The results of the research projects should provide a basis for implementation which will lead to sustainable effects in the studied populations as well as in the population at large.

The Foundation expects research proposals to be primarily the initiative of local researchers from the developing countries.



CURRENT POLICY

Sustainable improvement in human nutrition is one of the major issues in the portfolio of the Foundation. During more than 30 years basic and applied research in nutrition has been supported by the Foundation in more than 40 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 recognised that the public health relevance of the supported research as well as aspects of sustainability and educational issues should have a higher priority. Thus, priority is given to projects which lead to sustainable developments, and the implementation of the results of a research project should be immediate as well as sustainable. Highly sophisticated nutrition research of mainly academic interest without public health relevance has lower priority for support.

At present the Foundation's work is primarily concerned with human nutrition research 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.
- (4) education and interventions to improve nutrition and health

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.

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.

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

One of the Foundation's main aims is the transfer of scientific and technological knowledge to eligible countries. In cases where Foundation-sponsored research projects are realised in collaboration with scientists at universities and research institutes in

high-income countries, at least 80% of the budget has to be allocated in the low-income country.

Research grant applications from high-income countries can normally not be considered except under exceptional conditions.

The Foundation does not normally fund:

- (1) projects with low public health relevance
- (2) projects with doubtful sustainability
- (3) projects lacking transfer of scientific, technical and educational knowledge, i.e. lacking a capacity-building component
- (4) very expensive projects
- (5) nutrition surveys
- (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 protocol is innovative and exceptionally well justified.



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 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 as well as a downloadable form 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 application.

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 all 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 meeting respectively.



www.nestlefoundation.org

The Council of the Foundation consists of 5 Council Members and 2 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 by the Director and the President of the Foundation.

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The direction in which education starts a man will determine his future life.

Plato



REFERENCES AND CREDITS:

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PHOTO:

Cover: In a village near Umrwaba, North Kordofan (Sudan) - photograph by Paolo M. Suter

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