

Tackling Hidden Hunger



Putting Diet Diversification
at the Centre

Juan Lopez Villar

TWN

Third World Network

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Penang, Malaysia

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at the Centre**

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Summary

Introduction

THE lack of vitamins and minerals such as vitamin A, iodine and iron is the main cause of “hidden hunger” or micronutrient deficiency, and affects around two billion people in the world. As of today too little has been done to ensure adequate nutrition. At the World Summit for Children in 1990 one of the key nutrition goals was the virtual elimination of vitamin A deficiency and its consequences, including blindness, by 2000. Two years later, in 1992, the UN International Conference on Nutrition recognized that vitamin A deficiency and its consequences are fully preventable. Despite the high-level commitments made at these meetings, the decades have passed, and 14 years after the deadline, the target remains largely unaccomplished.

In light of this, a series of regional and global initiatives have been launched in recent years which aim to unite efforts from different sectors to combat malnutrition. In 2012, the New Alliance for Food Security and Nutrition was adopted under the auspices of the G8 leading industrial countries. On 8 June 2013, world leaders, including from countries participating in the Scaling Up Nutrition (SUN) Movement, came together to sign a global compact with the specific aim of preventing 20 million children from being stunted and saving no less than 1.7 million from dying of hunger by 2020. More recently, the Second International Conference on Nutrition was held from 19-21 November 2014.

There are three main types of interventions to prevent and combat these widespread vitamin and mineral deficiencies, which can be deployed individually or in combination: short-term supplementation; medium-term food fortification; and a long-term focus on dietary diversification.

Nutrient supplementation

Supplementation has been a key intervention to tackle especially vitamin A deficiency (VAD) in recent decades. Non-food-based strategies such as supplementation with vitamin A capsules (VAC) were considered a short-term solution that should be “progressively phased out as soon as micronutrient-rich food-based strategies enable adequate consumption of micronutrients”. Instead of being phased out, however, supplementation with vitamin A has been universalized in recent decades in developing countries, where all children between the ages of 6-59 months in more than 100 targeted countries receive high-dose vitamin A supplements every four to six months. The universal supplementation has been criticized by numerous nutritionists, who have proposed more sustainable and locally appropriate alternatives.

Food fortification

The success of food fortification programmes has been mixed. A current school of thought holds that while industrial fortification has experienced some measure of success, “the effect has not been felt, especially in the poor and marginal societies within the developing world, especially Sub-Saharan Africa”. For instance, 10 years after South Africa took the food fortification approach, a recent study on fortification levels in flour at retail level found that current levels of micronutrients added to maize meal and bread flour are unsatisfactory.

Biofortification has gained growing support in recent years, and new initiatives are being created to develop and disseminate new varieties of biofortified crops. Biofortification is considered a promising technology, but at the same time organizations such as the World Health Organization (WHO) recognize that more research is needed. Along the same lines, think-tanks such as the Overseas Development Institute (ODI) have concluded that “since this technology is not yet proven at scale, this should not be seen as the primary and still less the only way to tackle micro-nutrient deficiencies”. In their view, there are other strategies to be supported first, such as home gardens.

Biofortified crops can also be developed via genetic engineering (GE) techniques. However, taking into account the issues described in the preceding paragraphs and the potential risks of GE crops to human health and the environment, the development of biofortified GE crops would be inadequate to address hidden hunger and may instead carry additional risks.

Diet diversification

There is basically consensus that diet diversification is the permanent solution to hidden hunger. Most analysts have concluded that “there is general agreement that dietary diversification would be the ideal remedy to address micronutrient malnutrition”. Despite its prominent role among the key strategies to combat VAD, diet diversification seems to have received the least attention in the past decades.

In development strategies it has been recognized that gardening, a key tool to achieve diet diversification, has been neglected. A key element, sustainable diets, can only be achieved if the fields of agriculture and nutrition go hand in hand in a diverse,

sustainable manner. For instance, some forms of agriculture, such as monoculture and high-chemical-input agriculture, would not be included among measures to realize a sustainable diet. Approaches such as supplementation and fortification are also considered unnecessary to a sustainable diet.

The report from the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) stresses that in order to feed the more than 9 billion people that will inhabit the Earth by 2050, there is an urgent need to adopt more sustainable farming systems. One of the key systems identified was small-scale agroecology. Agroecology practitioners adopt a series of practices that support, *inter alia*, agricultural biodiversity and diet diversification. To achieve the changes in diets suggested, it would be imperative to also shift the currently dominant industrial agriculture paradigm towards agroecology. Agroecological approaches have been shown to provide enough food for all in a sustainable manner.

A roadmap to reducing hidden hunger

A roadmap to tackle hidden hunger is urgently needed. Some of the key pillars include:

- a) A human rights approach needs to be particularly embedded in national frameworks related to food, nutrition and health, among others.
- b) A shift from an over-emphasis on food fortification strategies, including biofortification, towards the permanent solution, i.e., diet diversification through locally available foods, is crucial for a global strategy on nutrition to be successful. This was the strategy previously agreed to at the 1992 UN International Conference on Nutrition and should be implemented.

- c) There is a risk that, if support for diet diversification is not increased, the so-called long-term and permanent solution will never materialize. It is not enough to do a bit of everything. The permanent solution needs to be seriously pursued. While a combination of interventions might be used in a certain country, diet diversification interventions need to be at the centre of the fight against hidden hunger.
- d) Home gardens are one of the successful strategies to combat micronutrient deficiencies in the developing world. The role of agroecology is also important in diversifying diets. However, on a global basis, funding for these strategies has been very low in comparison with other approaches. This needs to urgently change.
- e) There is a need to elaborate country roadmaps on a case-by-case basis. These should design concrete methodologies and channel results towards guaranteeing sustainable diets to country populations, on the basis of the abovementioned strategies.

CHAPTER ONE

GLOBAL ACTION AGAINST HIDDEN HUNGER: SETTING THE CONTEXT

1.1 The challenge of hidden hunger

MALNUTRITION is defined as the “lack of proper nutrition, caused by not having enough to eat, not eating enough of the right things, or being unable to use the food that one does eat”.¹ Malnutrition includes undernutrition, obesity and overweight, and micronutrient deficiency. Malnutrition remains the single largest cause of child mortality.² It is the underlying cause of death in an estimated 45 per cent of all deaths among children under five years of age.³ In 2012, 6.6 million children worldwide died before reaching the age of five.⁴ At least one-third of young children in the world today, mostly in Africa and Asia, suffer from some form of malnutrition.⁵ It should also be noted that small-scale farmers and their households form a group that is disproportionately vulnerable to these forms of hunger and malnutrition.⁶

¹ See Oxford Dictionaries: <http://www.oxforddictionaries.com/definition/english/malnutrition>

² See World Bank. 2010-2013. Nutrition Profiles. <http://www.worldbank.org/en/topic/health/publication/nutrition-country-profiles>

³ WHO. 2013. Millennium Development Goals. Fact Sheet 290. <http://www.who.int/mediacentre/factsheets/fs290/en/>

⁴ Reliefweb. 2013. Levels and trends in child mortality – Report 2013. <http://reliefweb.int/report/world/levels-trends-child-mortality-report-2013>

⁵ SUN. 2014. Scaling Up Nutrition in Outline. http://scalingupnutrition.org/wp-content/uploads/2014/03/SUN_in_Outline_Issue1.pdf

⁶ ODI. 2013. Smallholder agriculture’s contribution to better nutrition. <http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8376.pdf>

The chronic lack of vitamins and minerals, or micronutrient deficiency, has been also called “hidden hunger”. The lack of vitamins and minerals such as vitamin A, iodine and iron is the main cause of hidden hunger and malnutrition in the world today.⁷ Such forms of hunger are qualified as “hidden” because often there are no visible warning signs, so that people who suffer from it may not even be aware of it.⁸ A UNICEF representative describes it as such: “you might not feel it in the belly, but it strikes at the core of your health and vitality. It remains widespread, posing devastating threats to health, education, economic growth and to human dignity in developing countries.”⁹

Despite the lack of visible warnings, the consequences are nevertheless dire: hidden hunger can lead to mental impairment, poor health and productivity, or even death.¹⁰ It has been estimated that one in three people in the world suffer from hidden hunger, and women and children from the lower-income groups in developing countries are often the most affected.¹¹ In May 2008, the Copenhagen Consensus, which defines itself as a think-tank that aims to publicize the best way for governments and philanthropists to spend their money,¹² considered that

⁷ See UNICEF: http://www.unicef.org/republicadominicana/english/survival_development_12473.htm

⁸ See Micronutrient Initiative: <http://www.micronutrient.org/English/View.asp?x=573>

⁹ See UNICEF webpage: Statement from Kul C. Gautam, Deputy Executive Director of UNICEF. http://www.unicef.org/republicadominicana/english/survival_development_12473.htm

¹⁰ See Micronutrient Initiative: <http://www.micronutrient.org/English/View.asp?x=573>

¹¹ See Micronutrient Initiative: <http://www.micronutrient.org/English/View.asp?x=573>

¹² See Copenhagen Consensus webpage: <http://www.copenhagenconsensus.com/our-approach>

out of 30 options, the provision of micronutrients would be the world's best investment for development.¹³

At least two billion people around the world live with vitamin and mineral deficiencies.¹⁴ Worldwide, the three most common forms of micronutrient malnutrition are iron, vitamin A and iodine deficiency. Together, these affect at least one-third of the world's population, the majority of whom are in developing countries.¹⁵

There are three main types of interventions to prevent and combat these widespread vitamin and mineral deficiencies, which can be deployed individually or in combination: short-term supplementation; medium-term food fortification; and a long-term focus on dietary diversification.¹⁶ While there are no specific and detailed timelines for these interventions, in order to assess progress, "short term" is considered to be brief and less than a year; "medium term", more than a year and usually not more than 10 years; and "long term", a considerable period, especially one of more than 10 years.¹⁷

¹³ GAIN. 2008. Copenhagen Consensus ranks fighting malnutrition as best development investment. <http://www.gainhealth.org/press-releases/copenhagen-consensus-ranks-fighting-malnutrition-best-development-investment>. See the background papers of the Copenhagen Consensus on hunger and malnutrition: <http://www.copenhagenconsensus.com/publication/second-copenhagen-consensus-hunger-and-malnutrition>

¹⁴ GAIN. 2009. Investing in the future: a united call to action on vitamin and mineral deficiencies. Global Report. http://www.gainhealth.org/sites/www.gainhealth.org/files/report/investing_in_the_future_pdf_11749.pdf

¹⁵ WHO-FAO. 2006. Guidelines on food fortification with micronutrients.

¹⁶ BMZ. 2012. Supplementation, food fortification and dietary diversification. http://www.bmz.de/en/zentrales_downloadarchiv/themen_und_schwerpunkte/ernaehrung/food_fortification.pdf

¹⁷ See Merriam-Webster dictionary: <http://www.merriam-webster.com/>

1.2 Some global and regional initiatives to combat malnutrition

In the fight against malnutrition, not enough has been done in developing countries over the past 30 years. The then UN Special Rapporteur on the right to food concluded in 2014 that “too little has been done to ensure adequate nutrition, despite the proven long-term impacts of adequate nutrition during pregnancy and before a child’s second birthday”.¹⁸ In light of this, a series of regional and global initiatives have been launched in recent years which aim to unite efforts from different sectors to combat malnutrition. In 2012 for instance, the New Alliance for Food Security and Nutrition was created under the auspices of the G8 leading industrial countries.¹⁹ The New Alliance is considered by its adopters as “a shared commitment to achieving sustained and inclusive agricultural growth and poverty reduction in Sub-Saharan Africa”.²⁰ It is claimed that, “by partnering with the private sector during its first year, the New Alliance has already leveraged more than \$3.7 billion in private investment in African agriculture”.²¹ In the United States, the Feed the Future programme is the principal vehicle through which the US government contributes to the G8’s New Alliance and supports numerous projects related to nutrition.²²

¹⁸ UN General Assembly. 2014. Final Report: the transformative potential of the right to food. A/HRC/25/57. http://reliefweb.int/sites/reliefweb.int/files/resources/A_HRC_25_57_ENG.pdf

¹⁹ See The White House. 2012. Fact Sheet: G-8 Action on Food Security and Nutrition. <http://www.whitehouse.gov/the-press-office/2012/05/18/fact-sheet-g-8-action-food-security-and-nutrition>

²⁰ See <http://www.feedthefuture.gov/about>

²¹ The White House. 2013. Fact Sheet: The New Alliance for Food Security and Nutrition. <http://www.whitehouse.gov/the-press-office/2013/06/18/fact-sheet-new-alliance-food-security-and-nutrition>

²² Ibid.

The over \$3 billion of private sector investment commitments announced by the New Alliance were mobilized in partnership with Grow Africa. Grow Africa is a partnership platform that seeks to accelerate investments and transformative change in African agriculture in support of the Comprehensive African Agricultural Development Programme (CAADP), a programme of the New Partnership for Africa's Development (NEPAD) established by the African Union in 2003. The Grow Africa initiative includes numerous private sector companies, including biotechnology companies such as Monsanto, DuPont and Syngenta.²³

The momentum on the issue of nutrition grew throughout 2013.²⁴ The global Scaling Up Nutrition (SUN) Movement has stepped up its activities in the past two years.²⁵ The initiative, comprising high-profile leaders among a wide range of sectors including governments, the private sector, UN agencies and civil society, has worked to raise the need for increasing investments in fighting malnutrition at the global level.

On 8 June 2013, world leaders including those from SUN countries came together to sign a global compact with the specific aim of preventing 20 million children from being stunted and saving no less than 1.7 million lives by 2020.²⁶ The compact was endorsed by more than 80 different stakeholders, including

²³ Grow Africa. 2013. Sowing the seeds of growth. http://growafrica.com/wp/wp-content/uploads/2013/01/Grow_Africa_Booklet_Jan2013.pdf

²⁴ Scaling Up Nutrition. 2013. Note for the Record: 3rd SUN lead group meeting: 10th April 2013. <http://scalingupnutrition.org/wp-content/uploads/2013/05/Summary-Note-3rd-SUN-Lead-Group-Meeting.pdf>

²⁵ UN. 2012. UN Secretary-General appoints 27 global leaders to head worldwide effort to address child malnutrition. <http://scalingupnutrition.org/wp-content/uploads/2012/09/120410-SUN-Lead-Group-release-SG-Appoints-27-leaders-to-head-SUN.pdf>

²⁶ See SUN webpage: <http://scalingupnutrition.org/news/an-historic-moment-for-nutrition-nutrition-for-growth-summit-in-london#.U19sfsKKByI>

development partners, businesses, scientific organizations and civil society groups. It was signed in the UK,²⁷ and among the key participants at the London summit were two presidents and four prime ministers from Africa, Bill Gates, former UN Secretary-General Kofi Annan and Unilever chief executive Paul Polman. At that meeting it was claimed that donors had secured new commitments of up to \$4.15 billion to address malnutrition up to 2020. The press release also claimed that world leaders had signed a global agreement “that will prevent millions of infant deaths, and boost the life chances of millions more, by equipping the developing world with the means to beat malnutrition”.^{28,29}

The initiatives described above have the support of philanthropic foundations such as the Bill and Melinda Gates Foundation.³⁰ The Gates Foundation estimates that it will invest \$862.7 million from 2013 to 2020 in nutrition-specific and nutrition-sensitive programmes. Of this, \$492 million will be spent on nutrition-specific interventions.³¹ The interventions include a variety of initiatives such as breastfeeding programmes as well as biofortified crops.

More recently, the Second International Conference on Nutrition was held from 19-21 November 2014. It reviewed the progress made towards improving nutrition since 1992, reflected on

²⁷ DFID. 2013. Nutrition for growth: beating hunger through business and science. UK Presidency of G8 2013. <https://www.gov.uk/government/news/nutrition-for-growth-beating-hunger-through-business-and-science>

²⁸ Ibid.

²⁹ See also SUN. 2014. An introduction to the Scaling Up Nutrition Movement. http://scalingupnutrition.org/wp-content/uploads/2014/03/SUN_in_Outline_Issue1.pdf

³⁰ See SUN at: <http://scalingupnutrition.org/the-sun-network/donor-network>

³¹ DFID. 2013. Nutrition for Growth commitments: Executive summary. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/207274/nutrition-for-growth-commitments.pdf

nutrition problems that remain, as well as on the new challenges and opportunities for improving nutrition presented by changes in the global economy and food systems and by advances in science and technology, and identified policy options for improving nutrition.³²

1.3 The new business of malnutrition?

Interventions to tackle vitamin and mineral deficiency are not only of a public health nature, but also of a political and commercial nature.³³ It is undeniable, for instance, that fortified foods “comprise a substantial and increasing share in the estimated US\$ four trillion global food retail sales”.³⁴ It has been estimated that the value of the global market for vitamin supplements alone will reach \$3.3 billion by 2015.³⁵ The continued growth of this food market sector has thrown up some pertinent questions. For instance, Ursula Arens, a spokesperson for the British Dietetic Association, has asked, “Is mass medication through the food we eat the way to go?”³⁶

In the context of developing countries, representatives of the International Baby Food Action Network (IBFAN) have gone further by talking about a “new business of malnutrition” which in their perspective has “the potential for multi-billion dollar profits from exports to the developing world and is portrayed as a win-win solution for the economy and development [but] could

³² See <http://www.fao.org/about/meetings/icn2/en/>

³³ Lawrence, M. 2013. *Food Fortification: The Evidence, Ethics and Politics of Adding Nutrients to Food*. Oxford: Oxford University Press.

³⁴ Ibid.

³⁵ Ibid.

³⁶ *The Independent*. 2012. Should we be fortifying foods with nutrients? <http://www.independent.co.uk/life-style/food-and-drink/features/should-we-be-fortifying-foods-with-nutrients-6348759.html>

lead to a marketing bonanza that, instead of improving infant and young child health, could harm it and drain family budgets”.³⁷ Sterken describes how “the mantra, ‘the business of malnutrition is good for business’, is the principle promoted by the primary donor of global fortification programmes, the Global Alliance for Improved Nutrition (GAIN)”.³⁸ GAIN allies include the main food, drink and commodity giants, such as Coca-Cola, Pepsi, Unilever and Cargill, with a core agenda which, according to Sterken, is much wider than and different from public health, such as growing markets and monopolization of food commodities.³⁹ Box 1.1 provides a further example of private sector involvement in international negotiations relevant to food and nutrition issues.

1.4 Hidden hunger seen through the lens of a human rights approach

One of the key approaches to improving people’s nutrition around the world is to reinforce and adequately realize human rights related to nutrition, such as the right to food and the right to health. Article 25 of the Universal Declaration of Human Rights recognizes the right to food as part of the right to an adequate standard of living, which also includes the health and well-being of an individual and of his/her family. Specifically on health, the International Covenant on Economic, Social and Cultural Rights (ICESCR) in its Article 12 recognizes “the right

³⁷ Infact. 2011. The business of malnutrition: Breaking down trade rules to profit from the poor. <http://www.infactcanada.ca/whatsnew/codex-2011.html>

³⁸ Sterken, E. (undated). Private-public partnerships drive one solution to vitamin and mineral deficiencies: “Fortify West Africa” – A review. http://www.unscn.org/files/Newsletters/Review_of_Fortify_West_Africa_paper_April25_2012.pdf

³⁹ Ibid.

Box 1.1. The private sector at Codex negotiations relevant to malnutrition

“[At the November 2011 Nutrition Meeting of Codex, the UN body that sets international food standards, a] debate centred on a proposal by Ghana to update existing Codex Guidelines for a range of fortified complementary foods. Ghana, the majority of African and Latin American countries, IBFAN, the International Association of Consumer Food Organisations (IACFO) and the International Lactation Consultant Association (ILCA) were all anxious to protect breastfeeding, local family foods and skills, and to improve the safety and quality of these foods. However, their task was made especially tricky because of the extensive food industry presence – the norm for Codex meetings. Forty per cent of the 268 delegates were [from the] food industry, with 59 attending as members of Business Interest NGOs (BINGOS) and 49 included on government delegations – some even heading these delegations. For example, the Mexican delegation, which made many industry-friendly interventions, was 100 per cent [comprised of] industry, with US baby food companies Mead Johnson and Abbott alongside Kelloggs and Coca-Cola. Germany hosted the meeting and 12 of its 15 delegates were [from] industry, including baby food giants, Milupa (Danone) and Nestlé, alongside Coca-Cola, Kraft and others.”

Source: Infact. 2011. The business of malnutrition: Breaking down trade rules to profit from the poor.

of everyone to the enjoyment of the highest attainable standard of physical and mental health”.⁴⁰ Nutrition and health have already been directly linked in the constitutions and laws of several countries, as seen in Box 1.2.

In the 1996 Rome Declaration on World Food Security, heads of state and government reaffirmed the right of everyone to have access to safe and nutritious food, consistent with the right to

⁴⁰ See WHO (undated). The right to health. <http://www.ohchr.org/Documents/Publications/Factsheet31.pdf>

Box 1.2. Examples of laws that link nutrition and health

Constitution of India (1950):

Part IV, Art. 47, articulates a duty of the State to raise the level of nutrition and the standard of living and to improve public health: “The State shall regard the raising of the level of nutrition and the standard of living of its people and the improvement of public health as among its primary duties...”

Constitution of Ecuador (1998):

Chapter IV: Economic, Social and Cultural Rights, Art. 42: “The State guarantees the right to health, its promotion and protection, through the development of food security, the provision of drinking water and basic sanitation, the promotion of a healthy family, work and community environment, and the possibility of permanent and uninterrupted access to health services, in conformity with the principles of equity, universality, solidarity, quality and efficiency.”

adequate food and the fundamental right of everyone to be free from hunger.⁴¹ The right to food was explicitly articulated much earlier in 1966, in the ICESCR, as a component of the right to an adequate standard of living for an individual and his/her family.⁴² The right to an adequate standard of living for an individual and his/her family includes adequate food, clothing and housing, and the continuous improvement of living conditions.

⁴¹ See FAO webpage: <http://www.fao.org/worldfoodsummit/sideevents/papers/Y6959e.htm>

⁴² Article 11.1, International Covenant on Economic, Social and Cultural Rights.

CHAPTER TWO

NUTRIENT SUPPLEMENTATION

2.1 Eliminating vitamin A deficiency by 2000

SUPPLEMENTATION consists of using “highly concentrated vitamins and minerals produced by pharmaceutical manufacturers in the form of capsules, tablets or injections and administered as part of health care or specific nutrition campaigns”.⁴³ Supplementation has been a key intervention to tackle vitamin A deficiency (VAD) in recent decades.

At the World Summit for Children in 1990, one of the key nutrition goals was the virtual elimination of vitamin A deficiency and its consequences, including blindness, by 2000.⁴⁴ The summit was at the time the largest ever gathering of heads of state and government to commit to a series of goals to support the well-being of children.

Two years later, in 1992, the UN International Conference on Nutrition recognized that vitamin A deficiency and its consequences are fully preventable. The Conference ratified the objective of the World Summit for Children, by calling on governments to “accelerate efforts to achieve the elimination of

⁴³ BMZ. 2012. Supplementation, food fortification and dietary diversification. Ibid.

⁴⁴ FAO/WHO. 1992. World Declaration and Plan of Action for Nutrition. International Conference on Nutrition. <http://whqlibdoc.who.int/hq/1992/a34303.pdf>

vitamin A ... deficiencies ... in accordance with the year 2000 goals of the World Summit for Children”.⁴⁵ Despite these high-level commitments, the target remains largely unaccomplished today, 14 years after the deadline.

2.2 Tackling vitamin A deficiency through a non-food approach: the universalization of supplementation and marginalization of alternatives

Non-food-based strategies such as supplementation of intakes with vitamin A capsules (VAC) were considered a short-term solution that should be “progressively phased out as soon as micronutrient-rich food-based strategies enable adequate consumption of micronutrients”.⁴⁶ Instead of being phased out, however, supplementation with vitamin A has been universalized in recent decades in developing countries, where all children between the ages of 6-59 months in more than 100 targeted countries receive high-dose vitamin A supplements every four to six months.⁴⁷ Supplementation approaches to the problem of VAD have monopolized attention for decades.⁴⁸ It has stopped becoming a short-term approach as “donors had decided that VAC was the only way to go and nothing was to distract from it”.⁴⁹ And this is still the situation today. For instance, in 2013,

⁴⁵ Ibid.

⁴⁶ FAO/WHO. 1992. Plan of Action from the UN International Conference on Nutrition. <http://www.fao.org/docrep/u9920t/u9920t0b.htm>

⁴⁷ UNICEF. 2005. Vitamin A supplementation: progress for child survival. Working Paper. <http://www.idpas.org/SCNReportSite/supplements/VAS%20Progress%20Dec9%20London.pdf>; UNICEF. 2007. Vitamin A supplementation: a decade of progress. http://www.childinfo.org/files/Vitamin_A_Supplementation.pdf

⁴⁸ Greiner, T. 2013. Vitamin A: Moving the food-based approach forward. FAO and WHO. http://www.fao.org/fileadmin/user_upload/agn/pdf/Greiner_VITAMIN_A_Final.pdf

⁴⁹ Greiner, T. 2012. Vitamin A wars: the downsides of donor-driven aid. 24 September. <http://www.independentsciencenews.org/health/vitamin-a-wars-the-downsides-of-donor-driven-aid/>

a representative of Helen Keller International (HKI), in a statement before a US House of Representatives subcommittee, underlined the need for support on vitamin A capsules:

“With the support of USAID [United States Agency for International Development], HKI has become a recognized leader in distributing vitamin A capsules to mothers and children in countries across the world. Vitamin A supplementation is considered one of the most cost-effective public health interventions in the world. At a cost of approximately \$1 per child per year, it takes just two high-dosage vitamin A capsules to prevent vitamin A-related blindness and improve a child’s chance of survival. I urge the Subcommittee to provide at least \$23 million for vitamin A for fiscal year 2013.”⁵⁰

In contrast, Greiner asserts in a publication copyrighted by the UN Food and Agriculture Organization (FAO) and the World Health Organization (WHO) that “food-based approaches to improve nutritional status, despite being the only sustainable way forward, and the way that has succeeded in eliminating micronutrient deficiencies as public health problems in industrialized and apparently some newly industrializing countries like Thailand, continue to be largely ignored by international development donor agencies and the experts they work with”.⁵¹ Moreover this donor-driven approach has been

⁵⁰ Statement by David Glassman, Trustee, Helen Keller International. 2013. Subcommittee on State, Foreign Operations and Related Programs of the Committee on Appropriations of the US House of Representatives. <http://docs.house.gov/meetings/AP/AP04/20130319/100484/HHRG-113-AP04-Wstate-GlassmanD-20130319.pdf>

⁵¹ Greiner, T. 2013. Ibid.

expanded to more and more countries, even when there was not much need for it.⁵² He states:

“A donor-driven approach, universal vitamin A capsule (VAC) distribution has gradually been spread to more and more countries where it is less and less needed, creating conflict among groups involved in nutrition policy formulation, especially in countries with a low burden of VAD.”⁵³

More than 20 years ago many experts in the field believed that eliminating VAD was possible. The solutions were perfectly known, and the right recommendations were made by the UN International Conference on Nutrition and the World Summit for Children. While the recommendations underlined that it was key to favour “locally available foods”, as seen in Box 2.1, the strategies implemented as of now have overwhelmingly favoured a different approach (i.e., vitamin A supplementation).

The criticism of the universalization approach continues. Sachdev and Kapil from the Sitaram Bhartia Institute of Science and Research in India and the All-India Institute of Medical Sciences affirmed that the “universalization of the vitamin A supplementation programme represents a classic example of global recommendations framed by a small group of influential experts rather than by representative and unbiased scientists from populations that have to live with these guidelines”.⁵⁴

⁵² Greiner, T. 2013. Ibid.

⁵³ Greiner, T. 2013. Ibid.

⁵⁴ Sachdev, HPS and Kapil, U. 2010. Time to phase out the universal vitamin A supplementation programme. *World Nutrition*. Journal of the World Public Health Nutrition Association. Vol. 1, No. 2. June. <http://www.wphna.org>

Box 2.1. Excerpts from the Plan of Action for Nutrition adopted by the UN International Conference on Nutrition, 1992

7. Preventing and controlling specific micronutrient deficiencies

...

43. Recognizing the international, regional and national resources, coordination and support required, governments, in collaboration with international agencies, NGOs, the private sector/industry, other expert groups and the community, should adopt an appropriate combination of the following strategies:

...

- (d) Implement the most appropriate combination of the following measures: improved food availability, food preservation, food and nutrition education and training, dietary diversification, food fortification, supplementation and pertinent public-health measures such as primary health care, promotion of breast-feeding and safe drinking-water. International and regional cooperation in the sharing of resources to enable economies of scale should be encouraged.
- (e) Ensure that sustainable food-based strategies are given first priority particularly for populations deficient in vitamin A and iron, favouring locally available foods and taking into account local food habits. Supplementation of intakes with vitamin A, iodine and iron may be required on a short-term basis to reinforce dietary approaches in severely deficient populations, utilizing primary health care services when possible. Supplementation should be directed at the appropriate vulnerable groups, especially women of reproductive age (iodine and iron), infants and young children, the elderly, refugees and displaced persons. Supplementation should be progressively phased out as soon as micronutrient-rich food-based strategies enable adequate consumption of micronutrients.

Source: Plan of Action for Nutrition, UN International Conference on Nutrition. <http://www.fao.org/docrep/u9920t/u9920t0b.htm>

Box 2.2. High availability of vitamin A-rich foods vs. low consumption

“The challenge facing the vitamin A deficiency control program ... is that in spite of the relatively high availability of some vitamin A-rich foods in Ghana, their consumption has been low. The Ministry of Health prevalence survey revealed that only 19 per cent of the population consumed dark-green leafy vegetables regularly. Despite its relatively wide availability, children rarely consumed red palm oil, and less than 40 per cent of households consumed red palm oil in adequate quantities.

“... The proposed long-term solution is dietary diversification, which will include horticultural interventions to increase the production and availability of vitamin A-rich foods, such as dark-green leafy vegetables and orange-colored fruits and vegetables. Horticultural interventions involving home gardening have been shown to be an effective approach to increasing production and consumption of foods rich in β -carotene. Since they address the most important determinant of inadequate dietary intake, food-based approaches to improve vitamin A intake are the most rational, appropriate, and sustainable strategies to control vitamin A deficiency.”

Source: Amoafu, EF. 2001. Planning a national food-based strategy for sustainable control of vitamin A deficiency in Ghana: steps toward transition from supplementation. *Food and Nutrition Bulletin*. Vol. 22, No. 4.

The unsustainability in economic terms of the supplementation approach and the need to pursue alternative solutions were already recognized many years ago (see Box 2.2). For example, Amoafu, while analyzing multiple food-based approaches in the Ghanaian context, concluded in 2001 that the periodic “massive-dose supplementation approach has been subsidized by external support and is therefore not sustainable in the long term”.⁵⁵

⁵⁵ Amoafu, EF. 2001. Planning a national food-based strategy for sustainable control of vitamin A deficiency in Ghana: steps toward transition from supplementation. *Food and Nutrition Bulletin*. Vol. 22, No. 4.

Dr. Michael Latham, Professor Emeritus in the Division of Nutritional Sciences at Cornell University in the US, also challenged the validity of universal supplementation of high-dose vitamin A capsules for children from 6 months to 5 years, a huge programme existing in around 100 countries.⁵⁶ He affirmed in 2010 that there was weak scientific basis showing that such actions had decreased overall child mortality.⁵⁷ Latham showed very clearly that monolithic approaches to vitamin A deficiency would not work and there was a need for a series of interventions which he called “self-reliant approaches”: promoting breast-feeding, treating parasitic infections and encouraging people to grow and consume nutrient-rich fruits and vegetables in home, school and community gardens.⁵⁸

Latham proposed the following five key areas of intervention to tackle VAD:

- “Prevention: plant oils are sustainable: The sustainable and safe approach to prevention in areas and locations where vitamin A deficiency is still a public health problem, is the use of red palm and other plant oils that are exceedingly rich in vitamin A ...
- Measles: the right to vaccination: ... Measles immunization has proved to be very effective in reducing child mortality, including that associated with vitamin A deficiency.
- Freedom from infestation: ... De-worming of children who are most exposed to infestation, because of poor sanitation,

⁵⁶ UNICEF. 2007. Vitamin A supplementation: a decade of progress. http://www.unicef.org/immunization/files/Vitamin_A_Supplementation.pdf

⁵⁷ Latham, M. 2010. The great vitamin A fiasco. *World Nutrition*. May. Also available at: <http://www.wphna.org>

⁵⁸ *Washington Post*. 2011. Michael Latham, nutritionist who advocated breast-feeding, dies at 82. 20 April.

unsafe water and other factors, may well be more effective than nutritional supplementation as a preventive measure

...

- Breastfeeding is the best protection: The essential way to prevent shortage and deficiency of vitamin A ... in infants and young children is breastfeeding ... A major reason for vitamin A deficiency during and since the second half of the last century, has been a reduction of breastfeeding ...
- Plant-based food systems are best: ... Within countries where vitamin A deficiency remains an issue, governments at all levels, from national to local, need to support and encourage food systems that include leafy vegetables, fruits and other plant foods that are good, rich or very rich sources of carotene. Some of these, such as mangoes, yellow sweet potatoes, carrots, some palm and other tree fruits, and red palm and other plant oils, are well known and commonly available. The abundance of plants rich in carotenoids varies from country to country. Many of these tend to be overlooked in expert reports, especially when they are tropical foods not known in temperate countries where reports tend to be written and food composition tables compiled. Indeed, some exceedingly rich sources of carotene such as palm and other fruits, tend to be overlooked even in the countries where they are native or established, one reason being that they often grow wild, and even when cultivated do not feature in international or national food composition tables.”⁵⁹

In line with Latham’s conclusions, several authors had already, a decade earlier, thrown their support behind such alternative solutions. Scrimshaw, for instance, argued for the use of red

⁵⁹ Latham, M. 2010. Ibid.

palm oil, in the context of South Asia. In that region, where vitamin A deficiency contributes greatly to high child mortality, “the vitamin A status of the entire population can be improved through the production and promotion of red palm oil used as a salad and cooking oil or blended into other vegetable cooking oils”.⁶⁰ Moreover, FAO has also concluded that “Community and family vegetable and fruit gardens play a significant role in increasing small-scale production of micronutrient-rich foods”.⁶¹

⁶⁰ Scrimshaw, NS. 2000. Nutritional potential of red palm oil for combating vitamin A deficiency. *Food and Nutrition Bulletin*. Vol. 21, No. 2.

⁶¹ FAO. 1997. Preventing micronutrient malnutrition: a guide to food-based approaches – A manual for policy makers and programme planners. <http://www.fao.org/docrep/X5244E/X5244e00.htm#TopOfPage>

CHAPTER THREE

FOOD FORTIFICATION

3.1 Traditional fortification approaches

3.1.1 Definition and introduction

THE terms “fortification” or “fortified” food are used to describe the addition of nutrients not naturally present in a food, such as the addition of vitamin D to milk.⁶² The first time that food fortification was recorded was in 400 BC when it was suggested that iron filings be added to wine to increase soldiers’ “potency”.⁶³ The first time food fortification was used as a public health intervention was in Switzerland in the early 1920s⁶⁴ and this was later followed by the US.⁶⁵ As of now, around 80 countries require fortification of wheat flour, maize products and/or rice.⁶⁶

The use of fortified food as a public measure to improve nutrition and to reduce or eliminate nutritional deficiencies has been widely practised for many years by a number of developed countries, the most frequent examples being the fortification of salt with iodine; wheat flour with iron, vitamins B1 and B2,

⁶² USDA. 1982. The fortification of foods: a review.

⁶³ Mejia, L. 1994. Fortification of foods: historical development and current practices. *Food and Nutrition Bulletin*. Vol. 15, No. 4.

⁶⁴ Lawrence, M. 2013. Ibid.

⁶⁵ USDA. 1982. Ibid.

⁶⁶ See Flour Fortification Initiative: <http://www.ffinetwork.org/about/index.html>

Box 3.1. Food fortification in developed and developing countries

“Food fortification is likely to have played an important role in the current nutritional health and well-being of populations in industrialized countries. Starting in the early part of the 20th century, fortification was used to target specific health conditions: goitre with iodized salt; rickets with vitamin D-fortified milk; beriberi, pellagra and anaemia with B-vitamins and Fe-enriched cereals; more recently, in the USA, risk of pregnancy affected by neural-tube defects with folic acid-fortified cereals. A relative lack of appropriate centrally-processed food vehicles, less-developed commercial markets and relatively low consumer awareness and demand, means it has taken about another 50 years for fortification to be seen as a viable option for the less-developed countries.”

Source: Darnton-Hill, I and Nalubola, R. 2002. Fortification strategies to meet micronutrient needs: successes and failures. *Proceedings of the Nutrition Society*. Vol. 61, Issue 2.

and niacin; and milk and margarine with vitamins A and D⁶⁷ (see Box 3.1). The most common foods that have been fortified in industrialized countries are cereals, flour, baked goods, beverages, milk, infant formulas, margarine and meal replacements. Despite this substantial experience, a US report concludes that it is difficult to determine the relative effectiveness of fortification compared with the effects of an improved economy in improving nutritional status.⁶⁸

The number of developing countries with mandatory fortification of some type of food is growing. For instance, in Africa, there are over 15 countries already with mandatory fortified food. It has been estimated that 70 per cent of the population of African countries with mandatory fortification legislation are now

⁶⁷ See FAO. 2001. Targeting for nutrition improvement. <http://www.fao.org/docrep/004/y1329e/y1329e05.htm>

⁶⁸ USDA. 1982. Ibid.

regularly consuming at least one fortified food staple daily.⁶⁹ Some quarters consider that fortification should substitute supplementation interventions over time.⁷⁰

3.1.2 Limits to and concerns over fortification

Food fortification is a sector that attracts substantial private sector interest. Fortified foods can be an important tool for public health interventions; however, they are also excellent terrain for profits in business operations.⁷¹

There is a varied range of actors, from non-profit, business and governmental organizations to UN agencies, involved in fortification and marketing of fortified foods. Numerous alliances in the form of public-private partnerships have been created in recent years. For instance, a global Business Alliance for Food Fortification was established in October 2005.⁷² BASF, a leading chemical company, is also one of the world's leading vitamin producers with a focus on vitamin A.⁷³

Fortification of foods is a complex field that involves different technologies, which vary according to the different crops and products targeted, as well as in cost.⁷⁴ Complexities in creating

⁶⁹ Sablah, M et al. 2013. Food fortification in Africa: progress to date and priorities moving forward. http://www.sightandlife.org/fileadmin/data/Magazine/2013/27_3_2013/food_fortification_in_africa.pdf

⁷⁰ BASF. 2009. The fortification of staple crops. http://www.food-fortification.com/About_Food_Fortification/About_us.aspx

⁷¹ Lawrence, M. 2013. Ibid.

⁷² See GAIN-WBS. 2005. Public-private partnership launched to improve nutrition in developing countries. http://www-wds.worldbank.org/external/default/WDSPContentServer/WDSP/IB/2006/06/14/000160016_20060614171921/Rendered/PDF/364800baff1report01PUBLIC1.pdf

⁷³ See BASF. 2009. Ibid.

⁷⁴ USAID. 2008. Rice fortification in developing countries: a critical review of the technical and economic feasibility. http://www.spring-nutrition.org/sites/default/files/a2z_materials/508-Food-Rice-Fortification-Report-with-Annexes-FINAL.pdf

a fortified food include inherent difficulties associated with a particular crop and the nutrient to be added. For instance, attempts to fortify rice with vitamin A encountered numerous difficulties in earlier days: “Given the progress made to date in vitamin A fortification, continued research is warranted to address some of the remaining technical difficulties identified for fortifying rice with vitamin A.”⁷⁵

Some health specialists have concerns over the use of fortified foods. For instance, it was estimated in the 1980s that “evidence of clinical response to food fortification continues to be inconclusive, and a direct relationship between food fortification and improved nutritional status is difficult to establish”.⁷⁶ Along the same lines, Cannon concluded that “fortification may increase the nutrient quality of our food supply, but may have little to no effect on public health. Unfortunately, few researchers have examined the effect of fortification driven by industry on the national nutrient supply”.⁷⁷ While it is recognized that the use of fortified foods has practically eliminated several key diseases in developed countries, there is concern that the new range of fortified foods that are being marketed can substitute more nutritional natural products, as well as promote overconsumption of certain nutrients:

“Health specialists frequently view food fortification with mixed feelings. It is generally recognized that food fortification programs have assisted in virtually eliminating pellagra, beriberi, ariboflavinosus, rickets, and goiter from the United States through addition of key nutrients to foods such as flour and bread – items that are economically priced

⁷⁵ Dexter, PB. 1998. Rice fortification for developing countries. USAID. http://pdf.usaid.gov/pdf_docs/PNACD279.pdf

⁷⁶ USDA. 1982. *Ibid.*

⁷⁷ Cannon, MG. 2006. Food fortification: for profit or health? Food Regulation in the U.S. ANR 811.

and widely consumed by a large segment of the population. However, there is concern that addition of nutrients to foods that are inherently low in nutritive value, such as soft drinks, could encourage the selection of these foods, rather than similar but more nutritious foods such as fruit juices. Nutritional ‘horsepower’ races, that is, the addition of increasing numbers and amounts of nutrients to meet or beat market competition, could result in overconsumption past safe limits of intakes.”⁷⁸

Finally, another element to take into account is that the level of consumption of fortified foods should not exceed the individual’s needs: “universal fortification is not exempt from risks if the exposition period continues to last for years.”⁷⁹

3.1.3 Challenges to fortification in developing countries

A few dozen countries in the developing world have adopted some form of mandatory and voluntary fortification of different types of foods,⁸⁰ and some examples show the lack of improvement of nutritional status after interventions, due to a variety of reasons. That is why it is interesting that the Africa Biofortified Sorghum (ABS) initiative notes that while industrial fortification has experienced some measure of success, “the effect has not been felt, especially in the poor and marginal societies within the developing world, especially Sub-Saharan Africa”.⁸¹ Furthermore it states that “despite over 50 years of efforts, conventional or industrial fortification has had limited success”.⁸²

⁷⁸ USDA. 1982. Ibid.

⁷⁹ Preedy, VR et al. 2013. *Handbook of Food Fortification and Health*. Humana Press.

⁸⁰ See BASF: <http://www.food-fortification.com/Resources.aspx> and <http://www.food-fortification.com/Files/Download/Resources/MOST%20%20fortificationritu%20.pdf>

⁸¹ See <http://biosorghum.org/limitations.php>

⁸² See <http://biosorghum.org/bio.php>

Sometimes the problems are more of a logistical and economic nature, as Horton states:

“There are populations that are hard to reach with commercial fortification, particularly those living in more remote geographic areas and not utilizing purchased foods. It is harder to reach the poorest who are the most price sensitive and who buy lower grade items that are less likely to be fortified, as shown clearly for iodized salt.”⁸³

The South African government launched a national food fortification programme in 2003 for the mandatory fortification of bread flour and maize meal. Over 90 per cent of wheat flour and 70 per cent of maize meal is fortified in South Africa. However, malnutrition is still rife, with one in five children stunted and one in 10 underweight,⁸⁴ and iron, zinc and vitamin A deficiencies have not been reduced. Some 10 years later, a study on fortification levels in flour at retail level found that current levels of micronutrients added to maize meal and bread flour are unsatisfactory.⁸⁵ It is suspected that the “dosing levels of vitamin and mineral premix by the millers were inconsistent with regulatory requirements”.⁸⁶ It is interesting to note that “monitoring” had been consistently emphasized many years ago for early detection of similar problems, and a decade seems a long time for realizing that a measure has been ineffective. FAO stated back in the 1990s:

⁸³ Horton, S. 2006. The economics of food fortification. *The Journal of Nutrition*. Vol. 136. <http://jn.nutrition.org/content/136/4/1068.full.pdf>

⁸⁴ See <http://biosorghum.org/limitations.php>

⁸⁵ Yusufali, R et al. 2012. Flour fortification in South Africa: post-implementation survey of micronutrient levels at point of retail. *Food and Nutrition Bulletin*. Vol. 33, No. 4.

⁸⁶ GAIN. 2012. Lessons learned from 10 years of experience in Africa: sharing experiences in food fortification. http://www.wageningenportals.nl/sites/default/files/resource/lessons_learned_from_10_years_of_experience_in_africa_sharing_experiences_in_food_fortification.pdf

“Adequate monitoring of food fortification is essential and should include both monitoring of critical control points in the production and distribution of fortified foods and monitoring of micronutrient status of target populations, in establishing the need for intervention and to assess food fortification impact.”⁸⁷

In Guatemala, problems related to fortified corn have been documented in relation to consumer acceptance, increased bacterial spoilage and higher costs for fortified products, preventing corn from being accepted as a carrier vehicle.⁸⁸ Other general problems with food fortification are identified in the following analysis made by ABS (which instead promotes the development and use of biofortified transgenic crops):

“One of the challenges has been accessibility and affordability of fortified foods. Most resource poor communities cannot afford to pay the relatively high prices for processed foods and often prefer their unprocessed traditional foods. Also, these communities are often located in remote and marginal areas where transportation costs and weak demand make it uneconomically viable for traders to supply the processed, nutrition-enriched foods.

“A study of wheat flour fortification with iron in Guatemala revealed that despite anaemia rates decreasing during the study period, it was unlikely that the fortification program made that impact as consumption of wheat flour is not high enough especially amongst women from the poor, rural and indigenous households.

⁸⁷ FAO. 1995. Food fortification: technology and quality control.

⁸⁸ USDA. 1982. Ibid.

“The study also revealed that the forms of iron used to fortify such as ferrous fumarate could not be easily absorbed into the body from the digestive tract.

“Another challenge is long-term retention especially of vitamins. The nutrients are relatively stable when the product is within its packaging material but tend to rapidly break down when packaging is removed and the product is exposed to the environment. Breakdown of nutrient molecules due to heat treatment during processing or settling during transportation are other major challenges. Also, at times, the nutrients are not evenly distributed within the food stuffs so consumption of part of the foodstuff does not guarantee sufficient nutritional intake.”⁸⁹

Finally, there are commentators such as the former UN Special Rapporteur on the right to food who concluded that fortified foods may not be needed when local production is sufficiently diversified:

“Nutrition interventions should be but one part of broader-based strategies for the realization of the right to adequate food. For example, the provision of fortified foods (enriched to improve nutritional content) may be necessary, where local production is insufficiently diversified and incapable of supplying the full range of foods required for adequate diets. Rebuilding and strengthening local food systems through diversified farming systems to ensure the availability of and accessibility to adequate diets will be more sustainable in the long term. Food systems based on

⁸⁹ See <http://biosorghum.org/limitations.php>. See also Imhoff-Kunsch, B et al. 2007. Wheat flour fortification is unlikely to benefit the neediest in Guatemala. *The Journal of Nutrition*. April. <http://jn.nutrition.org/cgi/content/full/137/4/1017>

local knowledge and conditions, such as homestead or community gardens, can be a cost-effective way to combat micronutrient deficiency, as demonstrated by examples in Bangladesh, Cambodia, Nepal, the Niger and South Africa; such alternative food systems present the additional advantage of increasing local incomes and resilience to price shocks, another pathway through which positive nutritional outcomes can be achieved.”⁹⁰

3.2 Biofortification

Biofortification has gained growing support in recent years, and new initiatives are being created to develop and disseminate new varieties of biofortified crops.⁹¹ Biofortification is “the process by which the nutritional quality of staple crops is enhanced”, and is achieved via conventional plant breeding or genetic engineering.⁹² Biofortification is considered a promising technology, but at the same time organizations such as the World Health Organization recognize that more research is needed.⁹³ Promoters of biofortification consider that this path is more cost-effective and financially sustainable than supplementation and traditional fortification because “a one-time investment in breeding-based solutions can yield biofortified crops for farmers to grow around the world for years to come. It is this multiplier aspect of biofortification across time and distance that makes it so cost-effective in reducing malnutrition”.⁹⁴

⁹⁰ See De Schutter, O. 2011. Report submitted by the Special Rapporteur on the right to food. UN Human Rights Council. A/HRC/19/59. http://www.ohchr.org/Documents/HRBodies/HRCouncil/RegularSession/Session19/A-HRC-19-59_en.pdf

⁹¹ HarvestPlus. 2014. New partnership launched at Davos to improve nutrition for millions. <http://www.harvestplus.org/content/new-partnership-launched-davos-improve-nutrition-millions>

⁹² See WHO website: <http://www.who.int/elena/titles/biofortification/en/>

⁹³ See WHO website: <http://www.who.int/elena/titles/biofortification/en/>

⁹⁴ See HarvestPlus webpage: <http://www.harvestplus.org/content/faq>

3.2.1 Biofortification through conventional plant breeding

Since 2003, breeders from the Consultative Group on International Agricultural Research (CGIAR) have been working to develop varieties of seven staple crops (cassava, maize, sweet potato, beans, pearl millet, rice and wheat) that contain significant levels of critical micronutrients, such as vitamin A, iron and zinc. They are planning to adapt and multiply planting materials of these varieties and deliver them to rural households in Asia (Bangladesh, India and Pakistan), Africa (Mozambique, Nigeria, Rwanda, Uganda and Zambia), and Latin America and the Caribbean (Bolivia, Brazil, Colombia, Haiti, Honduras, Guatemala, Nicaragua and Panama).⁹⁵

Biofortification through conventional breeding “is an intervention strategy via conventional plant breeding currently being researched and developed for increasing the bio-absorbable content of micronutrients in the edible portion of staple food crops”.^{96, 97} As of now, the experience in the field is still lacking, and it is still considered by its promoters as a “potential solution” to reduce hidden hunger.⁹⁸ The promoters of this initiative state that biofortified crops would be a cost-effective alternative to supplementation and traditional fortification approaches: “Biofortification could prove to be a cost-effective and sustainable strategy for alleviating micronutrient deficiency in rural areas

⁹⁵ HarvestPlus. 2013. Prioritizing countries for biofortification interventions using country-level data. http://www.harvestplus.org/sites/default/files/working%20paper%20_11_web_0.pdf

⁹⁶ HarvestPlus. 2009. HarvestPlus statement on the potential benefits of biofortification on the nutritional status of populations.

⁹⁷ HarvestPlus. 2014. Global policymakers commit to scaling up nutritious foods to reach millions. 16 April.

⁹⁸ HarvestPlus. 2013. Prioritizing countries for biofortification interventions using country-level data. http://www.harvestplus.org/sites/default/files/working%20paper%20_11_web_0.pdf

of developing countries where the majority of the poor households' diets are comprised of staple foods and where access to food supplements and commercially marketed fortified foods is limited."⁹⁹

Many poor people in developing countries base their diets on a high amount of staple food such as maize, wheat and rice, but few micronutrient-rich foods such as fruits, vegetables, and animal and fish products. In this context it is expected that biofortified crops, which have been bred to have higher amounts of micronutrients, can help provide the poor and most needy sections of the population the needed vitamins and minerals.

Despite the positive impacts of biofortification as highlighted by its promoters, it is also recognized that it is not the panacea for hidden hunger. For instance, HarvestPlus, an organization focusing on biofortified staple food crops, is of the view that biofortification is not to be implemented in isolation, but as part of a strategy that includes dietary diversification, supplementation and commercial fortification, among others.¹⁰⁰ However, it is also necessary to acknowledge the limits of the other interventions. HarvestPlus considers that diet diversification is the long-term solution; supplementation requires permanent, medically skilled backup; and traditional fortification (e.g., iodized salt) requires central processing.¹⁰¹ Out of the three main interventions, however, supplementation and fortification have been the most used as of today.¹⁰²

⁹⁹ HarvestPlus. 2013. Prioritizing countries for biofortification interventions using country-level data. http://www.harvestplus.org/sites/default/files/working%20paper%20_11_web_0.pdf

¹⁰⁰ See <http://www.harvestplus.org/content/nutrients>

¹⁰¹ HarvestPlus. 2009. HarvestPlus statement on the potential benefits of biofortification on the nutritional status of populations.

¹⁰² HarvestPlus. 2009. Ibid.

There is wide consensus that biofortification is a promising technology; however, not all agree that this technology fix will solve the problem of malnutrition. Some authors consider that “more work is needed before its efficacy, effectiveness, and safety for humans and the environment is established”.¹⁰³ Similarly, the Overseas Development Institute (ODI) recognizes that “since this technology is not yet proven at scale, this should not be seen as the primary and still less the only way to tackle micro-nutrient deficiencies”.¹⁰⁴ In its view, there are other strategies to be supported first, such as home gardens.

3.2.1.1 Orange-fleshed sweet potato

Among the field-studied biofortified crops, the most well-known is probably the orange-fleshed sweet potato.¹⁰⁵ Orange-fleshed sweet potato biofortified with vitamin A was the first biofortified crop released by HarvestPlus and its partners. From 2007 to 2009, the project reached about 14,000 households in Mozambique and 10,000 farm households in Uganda.

Despite the encouraging results, proponents of the orange-fleshed sweet potato clearly affirm that the “increasing availability and consumption of beta-carotene-rich sweet potato is not a magic bullet for the African continent”.¹⁰⁶ They state

¹⁰³ Lawrence, M. 2013. Ibid.

¹⁰⁴ ODI. 2013. Ibid.

¹⁰⁵ Low, JW et al. 2007. A food-based approach introducing orange-fleshed sweet potatoes increased vitamin A intake and serum retinol concentrations in young children in rural Mozambique. *The Journal of Nutrition*. Vol. 137, No. 5. <http://jn.nutrition.org/content/137/5/1320.full.pdf+html>; HarvestPlus. 2012. Disseminating orange-fleshed sweet potato: Findings from a HarvestPlus project in Mozambique and Uganda. Washington D.C. http://www.harvestplus.org/sites/default/files/HarvestPlus_OFSP_Brief_English_2012_v2_small.pdf

¹⁰⁶ HarvestPlus. 2012. Disseminating orange-fleshed sweet potato: Findings from a HarvestPlus project in Mozambique and Uganda. Washington D.C. http://www.harvestplus.org/sites/default/files/HarvestPlus_OFSP_Brief_English_2012_v2_small.pdf

that it is meant to be “a complementary strategy to accompany existing nutrition interventions in areas where it can be grown”.¹⁰⁷

3.2.2 Biofortification through genetic engineering

As of today there is no crop biofortified through genetic engineering that has been granted approval for commercial cultivation. However, there are several varieties of biofortified genetically engineered (GE) crops in the pipeline.

Since the 1990s, the biotech industry has made numerous attempts to commercialize a wide range of GE crops. However, it quickly encountered stiff opposition and in numerous places around the world the potential risks of GE crops were perceived as unacceptable by a majority of the population. For instance, in Europe, strong opposition against GE foods had consolidated since the end of the 1990s and remains solid till today; in 2000, GE potatoes were withdrawn in the US due to commercial failure; in 2002, numerous African countries rejected GE food aid; in 2004, GE wheat was withdrawn from the market due to commercial reasons; China suspended commercialization of GE rice in 2011 and the US did not proceed either with wide commercialization of such products. The failures to market GE staple food in the past 20 years have been notable and the reluctance to accept GE food remains high today. Recently, hundreds of scientists issued a statement saying that there is no scientific consensus on GE food safety.¹⁰⁸ They also concluded that international treaties show widespread recognition of the

¹⁰⁷ HarvestPlus. 2012. Ibid.

¹⁰⁸ ENNSER. 2013. Statement: no scientific consensus on GMO safety. <http://www.ensser.org/increasing-public-information/no-scientific-consensus-on-gmo-safety/#sthash.NtvwWLkS.dpuf>. See also Fagan, J et al. 2014. GMO Myths and Truths. Earth Open Source.

risks posed by GE foods and crops. In this context of uncertainties and potential risks to health and the environment, biofortified GE crops aiming to tackle malnutrition could also encounter stiff resistance, particularly when viable alternative routes to sustainably tackle hidden hunger are available.

3.2.2.1 Golden Rice

3.2.2.1.1 Main actors and players

In 2000, Ingo Potrykus was in the spotlight, with *Time* magazine announcing that a GE variety of rice that he had developed, called Golden Rice, “could save a million kids a year”.¹⁰⁹ It further said that “the consumers include at least a million children who die every year because they are weakened by vitamin-A deficiency and an additional 350,000 who go blind”.

Golden Rice is a variety of rice produced through modern biotechnology to biosynthesize beta-carotene, a precursor of vitamin A, in the edible parts of rice. It aims to produce fortified food to be grown and consumed by populations with VAD. Possible commercialization of Golden Rice by the International Rice Research Institute (IRRI) in the Philippines was estimated to begin around 2011, but as of today it has not become a reality. According to IRRI, commercialization should not be expected before 2016.¹¹⁰

In February 2013, IRRI in partnership with the Philippine Rice Research Institute announced that they had finished two seasons of field trials of Golden Rice in the Philippines. IRRI

¹⁰⁹ *Time*. 2000. This rice could save a million kids a year. <http://content.time.com/time/magazine/article/0,9171,997586-1,00.html>

¹¹⁰ Oryza. 2014. Will 2016 be the year of Golden Rice? 8 July. <http://www.oryza.com/news/research-development/will-2016-be-year-golden-rice>

recognized that “it has not yet been determined whether daily consumption of Golden Rice does improve the vitamin A status of people who are vitamin A deficient and could therefore reduce related conditions such as night blindness”.¹¹¹ In order to determine this, and if national regulators approve it, the initiative will cooperate with Helen Keller International and other partners to conduct “a controlled community study to ascertain if eating Golden Rice every day improves vitamin A status”.¹¹² Helen Keller International is a long-time partner of USAID in efforts to promote supplementation with vitamin A capsules in the Philippines.¹¹³

In 2011, IRRI received a \$10.3 million grant from the Bill and Melinda Gates Foundation, under the Grand Challenges in Global Health initiative, to develop Golden Rice varieties not only in the Philippines but also in Bangladesh, so IRRI will also be partnering with the Bangladesh Rice Research Institute in this effort.¹¹⁴ Some of the other main donors include the Rockefeller Foundation, USAID, HarvestPlus, the European Commission, Swiss Federal Funding and the Syngenta Foundation.¹¹⁵ Among the members of the so-called “Humanitarian Board” of the Golden Rice Project are representatives from USAID, the United States Department of Agriculture (USDA), IRRI and former employees of Syngenta.

¹¹¹ IRRI. 2013. Clarifying recent news about Golden Rice. October 2013.

¹¹² Ibid.

¹¹³ Klemm, RDW et al. 1996. Coverage and impact of adding vitamin A capsule (VAC) distribution to annual National Immunization Day in the Philippines. http://pdf.usaid.gov/pdf_docs/pnacn875.pdf

¹¹⁴ Bill and Melinda Gates Foundation. 2011. Nutritious rice and cassava aim to help millions. Press release. 13 April. <http://www.gatesfoundation.org/Media-Center/Press-Releases/2011/04/Nutritious-Rice-and-Cassava-Aim-to-Help-Millions-Fight-Malnutrition>

¹¹⁵ Golden Rice Project. See <http://www.goldenrice.org/>

The Golden Rice Project webpage claims that “a good start is a food start!” and it is completely right. However, the race to address vitamin A deficiency in developing countries began more than two decades ago, so it should not be seen as a “start”, but rather as demonstrating the need for a paradigm change in the strategic design and implementation of efforts.

The Golden Rice Project presents itself as an inclusive project. It does not claim that Golden Rice is a magic bullet against malnutrition as was portrayed in the media in 2000, but only claims to be one additional solution to joint efforts with others. Very importantly, it recognizes that it is only the second-best approach to malnutrition:

“The best way to avoid micronutrient deficiencies is by way of a varied diet, rich in vegetables, fruits and animal products. The second best approach, especially for those who cannot afford a balanced diet, is by way of nutrient-dense staple crops.”¹¹⁶

In addition, the Project also makes very interesting statements in relation to the nature of the activity of biofortifying crops through genetic engineering, as compared to supplementation:

“Golden Rice has the potential to complement existing efforts that seek to reduce blindness and other VAD induced diseases. Those efforts include industrial fortification of basic foodstuffs with vitamin A, distribution of vitamin supplements, and increasing consumption of other foods rich in vitamin A. Those programs are successful mainly in urban areas but still around 45% of children around the world are not reached by supplementation programs.

¹¹⁶ See <http://www.goldenrice.org/>

Moreover, these programs are not economically sustainable. Small countries, like Nepal or Ghana, require about 2 million dollars every year to run the campaigns, in spite of the negligible cost of the vitamin A capsules. A large country like India cannot afford to run country-wide programs, because the costs become prohibitive. There is no guarantee that donors and governments will be able to carry on funding those programs year after year. Biofortified crops like Golden Rice offer a long-term sustainable solution, because they do not require recurrent and complicated logistic arrangements once they have been deployed.”¹¹⁷

Importantly, the statement recognizes the economic unsustainability of the VAC approach to VAD, something that paradoxically USAID, a funder and member of the Humanitarian Board of the Golden Rice Project, has been supporting as a mainstream solution for more than two decades. Through its support to the Golden Rice Project, USAID is acknowledging the fact that VAC programmes are not economically sustainable. This of course runs counter to claims made a few years back, in a publication which USAID supported financially, that VAC programmes would be sustainable in the future:

“[I]t may take many years for national programs to become independent of donor funds for vitamin A capsules. However, incremental incorporation of this and other program costs suggests progress toward a sustainable program.”¹¹⁸

The Golden Rice Project also claims that Golden Rice is a long-term sustainable solution to tackle vitamin A deficiency. Thus,

¹¹⁷ http://www.goldenrice.org/Content3-Why/why1_vad.php

¹¹⁸ Houston, R. 2007. Sustainability of vitamin A supplementation programs. Technical Brief. USAID et al. http://pdf.usaid.gov/pdf_docs/PNADK392.pdf

biofortified foods now seem to have become ends in themselves, something that was never envisaged in the consensus achieved at the UN International Conference on Nutrition in 1992. The German Federal Ministry for Economic Cooperation and Development affirmed in 2012 that the three main types of interventions to prevent and combat vitamin and mineral deficiencies are short-term supplementation, medium-term food fortification and long-term focus on balanced nutrition.¹¹⁹ Ted Greiner, Professor of Nutrition at Hanyang University in South Korea, shares the same view, considering biofortified foods as a medium-term solution, with the long-term solution being improving the diet requirements of the affected populations rooted in the diversification of the food diet via legumes, fruits and others.¹²⁰

It seems that there is a lack of clarity as to which mechanisms are short-term, medium-term and long-term. What is sustainable and what is not? As of now, unfortunately and paradoxically, the mainstream institutional donors seem to have transformed what was originally seen as a short-term solution – VAC – into a long-term one, as supplementation has already been in place for at least over 20 years. A medium-term solution – fortification, including biofortification – has now also seemed to become a long-term one.

3.2.2.1.2 Is Golden Rice necessary?

The Philippines and Bangladesh are two of the main countries targeted for experimentation with Golden Rice. In the Philippines, the prioritization of this costly research is questionable in the light of the fact that in recent years it has managed to decrease the public health significance of VAD from severe in 2003 to

¹¹⁹ BMZ. 2012. Supplementation, food fortification and dietary diversification.

¹²⁰ Greiner, T. 2012. Ibid.

moderate in 2008 among preschool children, and to mild among pregnant and lactating women.¹²¹ According to the Philippine Food and Nutrition Research Institute (FNRI) of the Department of Science and Technology, the prevalence of VAD among children declined from 40.1 per cent in 2003 to 15.2 per cent in 2008.¹²²

Bangladesh, on the other hand, has had a few projects of considerable scale that have proved that dietary diversification is a successful approach. Latham reports that the Swedish International Development Cooperation Agency (Sida) supported a communication effort to increase both the supply of and demand for foods rich in vitamin A. The project, implemented by a local non-governmental organization (NGO) Worldview International, reached over 10 million beneficiaries.¹²³ However, according to Latham, despite the successes they could not obtain additional support for similar projects on a regular basis:

“[B]oth the Bangladeshi government, and the other donors, informed Sida that there were many other priorities in Bangladesh, and that at least vitamin A had the capsule programme on-going. In other words, as long as ‘universal VAC’ was covering about half the children, nothing more would be supported.”¹²⁴

The efficacy of Golden Rice in fighting VAD has also been questioned. The potential lack of efficacy is another element that throws into doubt the necessity of Golden Rice.¹²⁵ For

¹²¹ Food and Nutrition Research Institute. 2008. Biochemical Survey Component. Accessed in October 2013. http://www.fnri.dost.gov.ph/images/stories/7thNNS/biochemical/biochemical_vad.pdf

¹²² Ibid.

¹²³ Latham, M. 2010. Ibid.

¹²⁴ Latham, M. 2010. Ibid.

¹²⁵ See Testbiotech. 2012. Golden Lies: The Seed Industry’s Questionable Golden Rice Project. http://www.foodwatch.org/uploads/media/golden_lies_golden_rice_project_2012_01.pdf

Box 3.2. Potential loss of carotenoids in Golden Rice?

“Golden Rice is only qualified for the fight against vitamin A deficiency if it does not lose drastic amounts of carotenoids during storage and cooking. Although it is relatively easy to determine carotenoid content, very little, if any, data has been made available on this issue to date. Although carotenoids seem to survive the cooking process, systematic trials with different cooking processes (boiling, steaming, frying) and their respective carotenoid content loss have not yet been published. Data is also missing regarding the shelf life of the rice. How and to what extent temperature, light and air humidity affect the degradation rate of its carotenoid content is one of the most decisive factors in assessing the potential of Golden Rice. Rice is frequently stored for months after harvesting before it is finally consumed. It is almost certain that significant losses in carotenoid content occur during this time. WHO also points out that storage, among other things, can result in carotenoid content loss. Tang et al., who conducted the first trial studies with volunteers in the United States, stored their rice at -20 degrees Celsius or even -80 degrees Celsius prior to cooking. Loss of carotenoid content is unlikely at temperatures this low. However, reliable data is still lacking on the shelf life of the rice under realistic conditions. Such information remains unavailable to date in spite of the fact that managers of the Golden Rice project have repeatedly announced its publication.”

Source: Testbiotech. 2012. Golden Lies: The Seed Industry's Questionable Golden Rice Project. http://www.foodwatch.org/uploads/media/golden_lies_golden_rice_project_2012_01.pdf

example, some authors consider that Golden Rice may lose considerable amounts of carotenoids during storage and cooking, as highlighted in Box 3.2.

3.2.2.2 Cassava

In sub-Saharan Africa about 95 per cent of the cassava produced is used for human consumption.¹²⁶ Alfred Dixon, a cassava breeder at the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria, says, “Cassava is to the African peasant

¹²⁶ Nweke, F. 2009. In IFPRI. 2009. Millions fed: proven successes in agricultural development.

farmers what rice is to the Asian farmers, or what wheat and potato are to the European farmers.”¹²⁷

Similar to the Golden Rice project, efforts are also underway to genetically modify cassava to increase the content of zinc, iron, protein and vitamin A. The initiative, supported by the Bill and Melinda Gates Foundation, is doing so because “a typical cassava-based diet ... provides less than 30% of the minimum daily requirement for protein and only 10%-20% of that for iron, zinc, and vitamin A”.¹²⁸ Representatives from the BioCassava Plus Nigeria project also made similar statements:

“In Nigeria, we often eat cassava two or three times a day, but it contains no vitamin A or iron. As a result, many people suffer from disease caused by a lack of vitamins and other important nutrients. BioCassava Plus is an opportunity to help people, especially in rural areas throughout Africa. It will give people vitamins they need through a food they already grow and eat.”¹²⁹

Earlier, in 2009, Richard Sayre of the Donald Danforth Plant Science Center in St. Louis, USA, and one of the key developers of the project, said, “This is one of the most ambitious projects ever attempted in a major crop plant ... We’re transforming it into a staple that will provide complete nutrition.”¹³⁰

¹²⁷ World Bank webpage accessed in October 2013: <http://www.worldbank.org/html/cgiar/newsletter/Mar96/4cas2.htm>

¹²⁸ Sayre, R et al. 2011. The BioCassava Plus program: biofortification of cassava for sub-Saharan Africa. *Annual Review Plant Biology*. <http://www.ncbi.nlm.nih.gov/pubmed/21526968>

¹²⁹ Statement by Chiedozie Egesi, product development director of BioCassava Plus Nigeria. See Bill and Melinda Gates Foundation. 2011. Nutritious rice and cassava aim to help millions. Press release. 13 April. <http://www.gatesfoundation.org/Media-Center/Press-Releases/2011/04/Nutritious-Rice-and-Cassava-Aim-to-Help-Millions-Fight-Malnutrition>

¹³⁰ Sci Dev Net. 2009. Supercassava to enter field trials. <http://www.scidev.net/global/biotechnology/news/-super-cassava-to-enter-field-trials.html>

Moreover, the Director of HarvestPlus saw this move as marking the time “for agriculture to lead a nutrition revolution”. The Bill and Melinda Gates Foundation provided a grant of \$8.3 million to the Donald Danforth Plant Science Center in 2011 to support the project.¹³¹ In 2011, there were already field trials of GE cassava in Puerto Rico and confined trials in Nigeria.¹³² Additional traits addressed by BioCassava Plus include increased shelf life, reductions in toxic cyanogenic glycosides to safe levels, and resistance to viral disease.

3.2.2.3 Sorghum

Sorghum is a key crop in Africa, and the continent produces about 20 million tonnes of sorghum per annum, about one-third of the world’s production.¹³³ Sorghum is vital for the food security of the most vulnerable populations in the African continent and is very well adapted to Africa’s climate, being both drought-resistant and able to withstand periods of waterlogging.

Experiments with GE sorghum are underway in the framework of the Africa Biofortified Sorghum (ABS) project, which aims to develop a transgenic sorghum that contains increased levels of essential nutrients, especially lysine, vitamin A, iron and zinc.¹³⁴ The project is financed under the Grand Challenges in Global Health initiative funded by the Bill and Melinda Gates Foundation.¹³⁵

¹³¹ Bill and Melinda Gates Foundation. 2011. Nutritious rice and cassava aim to help millions. Ibid.

¹³² Sayre, R et al. 2011. Ibid.

¹³³ See http://biosorghum.org/why_sorghum.php

¹³⁴ See <http://biosorghum.org/>

¹³⁵ Africa Harvest. 2007. The Africa Biofortified Sorghum project: a global vision with an African focus to fight poor nutrition with nutrient-rich crops. Mid-term report.

Africa Harvest Biotechnology Foundation International (Africa Harvest) is the lead institution in the ABS project. Through a consortium structure, it partnered with DuPont through the latter's subsidiary Pioneer Hi-Bred, the Council for Scientific and Industrial Research (CSIR), the Agricultural Research Council of South Africa (ARC), the African Agricultural Technology Foundation (AATF), the International Crops Research Institute for the Semi Arid Tropics (ICRISAT), the University of Pretoria, the University of California Berkeley (UC Berkeley), the Kenya Agricultural Research Institute (KARI), the Institute of Agricultural Research (IAR) and the West African Council for Agricultural Research and Development (CORAF/ WECARD).¹³⁶

ABS recognizes that “biofortification as a technology is not able to solve the whole challenge to malnutrition” but, in its opinion, can contribute significantly to addressing that challenge.¹³⁷ It also considers the approach to be sustainable:

“As the technology is built into the seed, it can sustainably perpetuate that nutrition as the crop reproduces over several generations thereby giving a high nutritional return with regard to the investment made. It can be added to staple crops that are suited for resource poor and marginal communities. It is sustainable as crop production can continue without external support from government or the private sector. Also, the technology is unlikely to compromise crop yields.”¹³⁸

¹³⁶ See <http://biosorghum.org/>

¹³⁷ See <http://biosorghum.org/complement.php>

¹³⁸ See <http://biosorghum.org/complement.php>

To justify its own suitability, the ABS project is very critical of the strategy of fortification that has been carried out so far, particularly in developing countries. It is important to recall that fortification of foods has been an important strategy to tackle micronutrient deficiencies over the past four decades and continues being so today. As cited earlier, ABS notes that while industrial fortification has experienced some measure of success, “the effect has not been felt, especially in the poor and marginal societies within the developing world, especially Sub-Saharan Africa”.¹³⁹ It goes on to state that “despite over 50 years of efforts, conventional or industrial fortification has had limited success”.¹⁴⁰ The statement is unambiguous: there have not been clear benefits from the fortification activities carried out to date in developing countries, particularly for the most vulnerable sectors of society.

3.2.2.4 Bananas and plantains

Bananas and plantains are important staple foods in many developing countries, especially in Africa. They provide food security and income for small-scale farmers who constitute the majority of producers. Most of the banana produced is consumed locally, and only around 15 per cent of the production is internationally traded.¹⁴¹

The Bill and Melinda Gates Foundation is supporting a consortium of organizations working on the development of a GE, high-provitamin A and high-iron banana. According to supporters of the project in Uganda:

¹³⁹ See <http://biosorghum.org/limitations.php>

¹⁴⁰ See <http://biosorghum.org/bio.php>

¹⁴¹ IITA. Webpage accessed in October 2013. <http://www.iita.org/banana-and-plantain>

“Banana-based diets ... are deficient in vitamin A and iron ... Bananas and plantains have the potential to serve as a highly effective vehicle for combating vitamin A and iron deficiencies, especially in East Africa, which has, by far, the world’s highest rates of banana and plantain consumption, and where 10-30 percent of all arable land under cultivation is planted in banana. Bananas and plantains have long been the most important food source of calories available to Ugandans. In 2007, these accounted for 17 percent of total daily per capita caloric food availability, as a single most important source of calories among Ugandans.”¹⁴²

The activities began in 2007 at Queensland University of Technology in Australia; and in late 2010, GE *sukalindizi* (sweet banana) and GE *nakinyika* (cooking banana) containing provitamin A and iron genes were grown in confined field trials at the National Agricultural Research Laboratories Institute of the National Agricultural Research Organization in Uganda.

At present, other types of GE bananas resistant to diseases¹⁴³ and other applications are being developed in other parts of the African continent.¹⁴⁴

3.2.3 The Bill and Melinda Gates Foundation and biofortification

The Gates Foundation’s support for improved foods via conventional breeding and genetic engineering described in this chapter lies in the fact that “in many developing countries, as

¹⁴² Fiedler, JL et al. 2013. An ex-ante analysis of the impact and cost-effectiveness of biofortified high-provitamin A and high-iron banana in Uganda. IFPRI Discussion Paper 01277. <http://www.ifpri.org/sites/default/files/publications/ifpridp01277.pdf>

¹⁴³ <http://www.cgiar.org/our-research/crop-factsheets/bananas/>

¹⁴⁴ African Centre for Biosafety. <http://www.acbio.org.za/images/stories/dmdocuments/GM-bananas.pdf>

much as 70 percent of an individual's daily calories come from a single staple food, making it difficult to consume enough vitamins and minerals".¹⁴⁵ However, at the same time the Gates Foundation recognizes that "eating a diverse diet is fundamental to good health".

Why then, if diversification is so fundamental, is the focus not on the source of the problem? Why is the Gates Foundation instead diverting such a great amount of resources towards strategies that run counter to the diversification of diets and that ironically risk perpetuating monolithic diets for the poorest people in developing countries? Golden Rice has been described by some of its proponents as a sustainable long-term solution; however, the rationale of this intervention is to cover situations where a single staple food is used in around 70 per cent of the diet, in which case the diet cannot be said to be "sustainable".¹⁴⁶

The Gates Foundation has a close relationship with biotech giant Monsanto, as it has bought more than \$20 million worth of shares in the company.¹⁴⁷ In addition, Monsanto is cooperating with the Gates Foundation, which supports a Monsanto maize project in Africa, and both participate together regularly in many high-profile conferences and events.¹⁴⁸ The ties between

¹⁴⁵ See Gates Foundation webpage: <http://www.gatesfoundation.org/What-We-Do/Global-Development/Agricultural-Development/Optimizing-Nutrition-Outcomes-from-Investments-in-Agriculture#SummaryofLiteratureReview>

¹⁴⁶ See Chapter Four.

¹⁴⁷ *The Guardian*. Why is the Gates Foundation investing in GM giant Monsanto? <http://www.theguardian.com/global-development/poverty-matters/2010/sep/29/gates-foundation-gm-monsanto>

¹⁴⁸ Monsanto. 2013. Monsanto's Begemann discusses food security at Chicago Council Symposium. <http://www.monsanto.com/newsviews/Pages/brett-begemann-global-food-security-panel.aspx>; Monsanto. 2012. Hugh Grant op-ed: Let's end world hunger. <http://www.monsanto.com/newsviews/Pages/hugh-grant-op-ed-world-hunger.aspx>; Monsanto. 2009. Building a world without hunger. <http://www.monsanto.com/newsviews/Pages/World-Without-Hunger.aspx>

Monsanto and the Gates Foundation are further deepened by prominent Monsanto employees who have gone to work for the Foundation. This is the case with Rob Horsch, who after 25 years of service left Monsanto to join the Gates Foundation. “The decision to go to the Gates Foundation wasn’t easy. My friends are here at Monsanto, my history is here at Monsanto, and there’s still a lot of high-impact work to be done,” said Horsch back in 2006.¹⁴⁹ Horsch is today a Deputy Director of the Global Development Division at the Gates Foundation and leads the Agricultural Research and Development team which manages a portfolio of grants to develop more productive and nutritious versions of staple crops.¹⁵⁰ The Global Development Division has supported Golden Rice and other GE crops, as well as conventionally bred varieties of sweet potatoes, beans, cassava, bananas, pearl millet and wheat. According to the Gates Foundation, the Agricultural Development, Nutrition, and Global Health Discovery teams “have committed nearly \$100 million to develop and disseminate nutritionally-enhanced staple foods”.¹⁵¹

¹⁴⁹ Monsanto. 2006. Reflections of a science pioneer. <http://www.monsanto.com/newsviews/Pages/Rob-Horsch-Reflections-of-Science-Pioneer.aspx>

¹⁵⁰ See <http://www.gatesfoundation.org/What-We-Do/Global-Development/Agricultural-Development/Strategy-Leadership/Rob-Horsch>

¹⁵¹ See <http://www.gatesfoundation.org/What-We-Do/Global-Development/Agricultural-Development/Optimizing-Nutrition-Outcomes-from-Investments-in-Agriculture#SummaryofLiteratureReview>

CHAPTER FOUR

DIET DIVERSIFICATION

4.1 Consensus exists over the best intervention to tackle hidden hunger

THE causes of vitamin and mineral deficiencies are multiple and interconnected. At the heart of the problem is that the causes are related to diet: the lack of consumption of sufficient amounts of nutrient-rich foods such as meat, eggs, fish, milk, legumes, fruits and vegetables. Moreover, the problem is made worse by inadequate health care and sanitation, disease, and a lack of education in infant- and child-care.¹⁵² (See Box 4.1 for an example.)

There is basically a consensus that diet diversification is the permanent solution to hidden hunger. As far back as the 1980s the US Department of Agriculture (USDA) already stated that “the long run aim is to diversify people’s diets such that most of their needs can be met from food”.¹⁵³ More than 30 years later, most analysts have concluded that “there is general agreement that dietary diversification would be the ideal remedy to address micronutrient malnutrition”.¹⁵⁴ Similarly, even promoters of

¹⁵² USAID et al. 2009. Investing in the future: A united call to action on vitamin and mineral deficiencies. http://www.unitedcalltoaction.org/documents/Investing_in_the_future_Summary.pdf

¹⁵³ USDA. 1982. Ibid.

¹⁵⁴ Stein, AJ. 2010. The potential of biofortification of rice, beans, cassava and maize throughout Latin America. http://www.ajstein.de/cv/Stein_IFPRI_biofortificationLatAm.pdf

Box 4.1. The causes of malnutrition in the Micronesian island of Pohnpei

“Studies carried out after World War II in Pohnpei showed no evidence of malnutrition among the population and an almost complete absence of obesity. In 50 years [however] health ... has gone severely downhill. Nowadays, stunting, vitamin A deficiency and dental decay among children [are] abundant, not to mention that one in three Pohnpeians are affected by diabetes, and overweight is so common that it’s seen as the norm.

“These changes in health are directly linked to changes in lifestyle and diets, in which traditional foods such as fish, root crops and starchy fruits (breadfruits and banana), vegetables and fruits have been substituted by imported foods such as white rice, flour products, sugar, fatty meats, soft drinks and other sweet processed foods.”

Source: Interview with Dr. Lois Englberger. *Farming Matters*, 27.3, September 2011.

biofortified crops such as HarvestPlus recognize that diet diversification is the long-term solution.¹⁵⁵ Furthermore, “no single intervention will solve the micronutrient malnutrition problem, the permanent solution to micronutrient malnutrition in developing countries is a diverse diet that includes pulses, fruits, vegetables, fish, and animal products”.¹⁵⁶ The International Food Policy Research Institute (IFPRI), on behalf of several partners, also concludes that “the final, permanent solution to micronutrient malnutrition in developing countries is a substantial improvement in dietary quality – higher consumption of pulses, fruits, vegetables, fish, and animal products, which the poor already desire but cannot presently afford”.¹⁵⁷

¹⁵⁵ HarvestPlus. 2009. HarvestPlus statement on the potential benefits of biofortification on the nutritional status of populations.

¹⁵⁶ See <http://www.harvestplus.org/content/learn-more?print>

¹⁵⁷ IFPRI et al. 2002. Biofortified crops for improved human nutrition. A challenge program proposal. <http://www.cgiar.org/www-archive/www.cgiar.org/pdf/biofortification.pdf>

Even key representatives from the private sector in the malnutrition debate agree with this in a more implicit way. For example, BASF asserts, without explicitly mentioning diet diversification, that “the permanent and logical solution to eliminating Vitamin A deficiency should be through modifications in patterns of food production, consumption and distribution”.¹⁵⁸ This certainly would encompass diet diversification approaches.

Moreover, it is also important to acknowledge that if alternatives exist to move forward with diet diversification, this would be the best option to choose. A 2013 report of the Scaling Up Nutrition (SUN) Movement¹⁵⁹ recognizes that only when diet diversification is not possible would fortification be an option: “when people cannot access micronutrients through diverse, affordable, locally grown foods, it may be appropriate to fortify staples and condiments such as salt, sugar and oil.”¹⁶⁰

4.2 Is the diet diversification intervention being neglected?

It is clear, from the previous paragraphs, that nobody disagrees that diet diversification is the long-term and most sustainable approach for addressing hidden hunger. A critical question thus arises: where is diet diversification in the present global strategy to address micronutrient deficiencies? From previous chapters it seems that other interventions, such as fortification, have occupied a more prominent role in key global initiatives. If the

¹⁵⁸ BASF. 2009. Ibid.

¹⁵⁹ The SUN Movement describes itself as a “unique Movement founded on the principle that all people have a right to food and good nutrition. It unites people – from governments, civil society, the United Nations, donors, businesses and researchers – in a collective effort to improve nutrition”. See <http://scalingupnutrition.org/about>

¹⁶⁰ Scaling Up Nutrition. 2013. Draft. State of the SUN Movement. Progress Report. http://scalingupnutrition.org/wp-content/uploads/2013/09/SUN_Progress_Report_2013_ENGLISH1.pdf

permanent solution is so clear, what is the problem then in moving forward with greater focus on diet diversification? How long will it take to start implementing solid national programmes on diet diversification?

In most of the literature reviewed, the causes for the current lack of adequate support for diet diversification are framed in quite a general manner. For example, USAID, the World Bank, the Global Alliance for Improved Nutrition and the Micronutrient Initiative have recognized that the main avenue towards tackling hidden hunger is diet diversification, but this is considered by them to be “a complex and long-term undertaking”:

“Quality, varied diets would resolve most vitamin and mineral deficiencies. However, improving the diets of the world’s poor is a complex and long-term undertaking that is largely dependent on rising incomes, improved access to food, better health and nutrition services delivery, and changing infant and young child feeding practices.”¹⁶¹

HarvestPlus provides no detailed answers to these questions; however, it states that “for the poor, this may take decades to realize”,¹⁶² and “is often unaffordable by the very poor and by remote dwellers, usually those at greatest risk of deficiencies”.¹⁶³ Stein adds that “it is also understood that diet diversification is often difficult to achieve in resource poor areas of the world, at least in the short to medium term”.¹⁶⁴ Meenakshi repeats the argument, citing poverty as a barrier to diet diversification: “The

¹⁶¹ USAID et al. 2009. Ibid.

¹⁶² See HarvestPlus: <http://www.harvestplus.org/content/learn-more>

¹⁶³ HarvestPlus. 2009. HarvestPlus statement on the potential benefits of biofortification on the nutritional status of populations.

¹⁶⁴ Stein, AJ. 2010. Ibid.

premise of biofortification is that a diverse diet rich in micronutrients is out of reach of many of the world's poor ... Dietary diversity to achieve micronutrient intake adequacy is a luxury that the poor can often not afford.”¹⁶⁵ In contrast, she believes that with biofortified crops, the economic barriers of poverty can be overcome.¹⁶⁶

However, some authors believe that fighting micronutrient deficiency through diet diversification is a key pathway and is economically feasible. For instance, as cited earlier, the former UN Special Rapporteur on the right to food, Olivier De Schutter, concludes that “food systems based on local knowledge and conditions, such as homestead or community gardens, can be a cost-effective way to combat micronutrient deficiency”.¹⁶⁷

Among the key strategies to combat hidden hunger, dietary diversification seems to have received the least attention in the past decades. The implementation of diet diversification programmes has remained, in the majority of cases, at the pilot project level.¹⁶⁸ Solid and sustainable multi-country initiatives for diet diversification do not seem to have occurred yet. By 2001, UN representatives affirmed that dietary diversification “interventions have been mainly on a relatively small, often pilot-project scale, and there is little known about the impact of the interventions”.¹⁶⁹ Moreover, most studies considering the cost-benefit analysis of nutrition interventions have overwhelmingly

¹⁶⁵ Meenakshi, JV. 2009. Biofortification. Best practice paper: new advice from CCo8. <http://www.copenhagenconsensus.com/sites/default/files/biofortification.pdf>

¹⁶⁶ Ibid.

¹⁶⁷ De Schutter, O. 2011. Ibid.

¹⁶⁸ De Wagt, A. 2001. Vitamin A deficiency control programs in Eastern and Southern Africa: a UNICEF perspective. *Food and Nutrition Bulletin*. Vol. 22, No. 4.

¹⁶⁹ Ibid.

concentrated on supplementation and fortification, not on diet diversification.¹⁷⁰

A study published in 2010 from the University of Washington, analyzing more than 100 bibliographic references related to agriculture and diet diversification, concludes that one of the greatest knowledge gaps concerning agricultural interventions towards diet diversification is the “lack of integration between program design and evaluation”. “Many evaluations are based on small sample sizes, lack control groups or baseline data, are subject to selection bias or face other challenges to rigorous statistical analysis.” Furthermore, the same study concludes that “long-term follow-ups are uncommon, and conclusions about the sustainability of different programs are therefore difficult to support empirically”.¹⁷¹

In development strategies, it has been recognized that gardening, a key tool to achieve diet diversification, has been neglected because of the “paucity of data on the output of traditional home gardening systems expressed in quantitative and monetary-equivalent terms which could demonstrate a significant contribution to economic output and national development”:¹⁷²

“As a result, most agricultural and research programmes tend to underestimate or discount the actual or potential importance of home gardening as a food security strategy, and in particular as a strategy for meeting micronutrient needs.”

¹⁷⁰ Stokes-Prindle, C and Anderson, CL. 2010. Agriculture and diet diversification: evidence and pathways to improved nutrition. Evans School of Public Affairs, University of Washington. http://evans.washington.edu/files/Evans_UW_Request_100_Agricultural_Pathways_to_Dietary_Diversification.pdf

¹⁷¹ Ibid.

¹⁷² FAO. 1997. *Agriculture, food and nutrition for Africa – A resource book for teachers of agriculture*. <http://www.fao.org/docrep/w0078e/w0078e06.htm>

Despite the complexity, it is necessary to establish clear strategies and timelines that indicate to the countries affected by hidden hunger how long it would take to put in place a long-term strategy. The question is very pertinent because key influential organizations had already raised the issue and proposed actions on diet diversification several decades ago. With limited resources in place, are the right priorities being identified? Or, as has happened with the campaigns on VAD, have resources been diverted by over-focusing on short-term, non-food and unsustainable methodologies, which have subsequently become *de facto* medium- or long-term solutions?

4.3 Sustainable diets

4.3.1 Making sustainable diets happen

Despite the challenges in moving forward with diet diversification, organizations such as FAO are very supportive of this approach. In a 1997 report focused on Africa, FAO points out some of the key strategies for food and dietary diversification at the community and household levels. These activities include: promotion of mixed cropping and integrated farming systems; promotion of underexploited traditional foods and home gardens; small livestock raising; promotion of fishery and forestry products for household consumption; promotion of improved preservation and storage of fruits and vegetables to reduce waste, post-harvest losses and effects of seasonality; strengthening of small-scale agro-processing and food industries; and nutrition education to encourage the consumption of a healthy and nutritious diet all year round.¹⁷³

¹⁷³ Ibid.

FAO continued its analysis of the nutrition sector in the African context by insisting on the need to send a strong message about the importance of diversifying diets. It said that almost all of the necessary micronutrients are already found in existing plants in nature and are mostly available at the local level (see Table 4.1):

“The message to diversify the diet should be supported by a government campaign to diversify the meals provided in schools and colleges, in hospitals and at work sites through foreign subsidy and/or encouragement of the sale of traditional dishes, including an increased variety of snack foods ... Since women are usually the most responsible for food within a household, nutrition education is primarily addressed to them. However, male household members also influence which foods are consumed, as often they control the bulk of family income. Nutrition education and training should be given to men and women and introduced into the curricula of teachers’ training colleges, primary and secondary schools, agricultural schools and universities. The use of mass media such as radio and television is also gaining increasing importance for informing and educating the public on nutrition and healthy lifestyles.”¹⁷⁴

There is a need to eat a variety of foods every day so that the body gets enough energy and everything it needs to be active to grow and be protected against illness, as shown in Box 4.2 and Figure 4.1.¹⁷⁵

¹⁷⁴ Ibid.

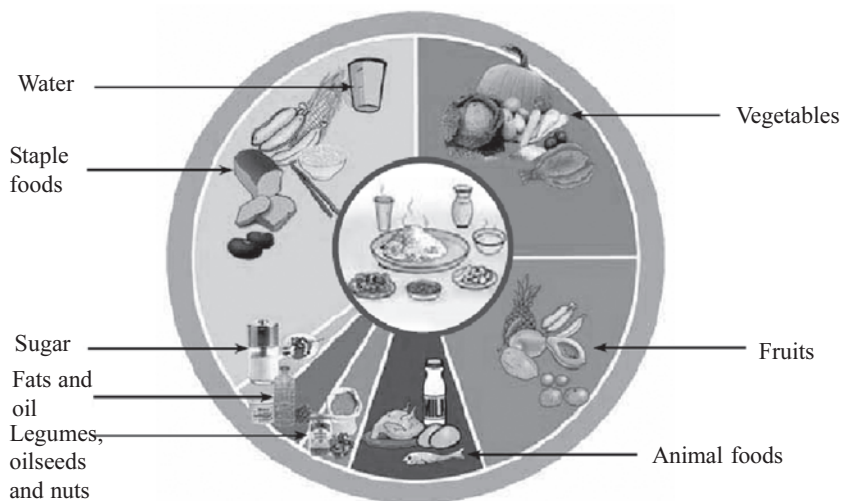
¹⁷⁵ FAO. 2009. *Nutrition Handbook for Community Mobilisers*.

Table 4.1. Specific nutrients found in the major plant groups

Plant group	Nutrient
Cereals	Carbohydrates, protein, dietary fibre, vitamin B complex, iron, calcium
Roots	Carbohydrates, protein, some vitamin C
Legumes, oilseeds, nuts	Carbohydrates, protein, dietary fibre, iron, calcium, vitamin B complex
Fruits and vegetables	Vitamin C, vitamin A, iron, calcium, vitamin B complex, dietary fibre

Source: FAO. 1997. Agriculture, food and nutrition for Africa – A resource book for teachers of agriculture.

Figure 4.1. A healthy diet



Source: FAO. 2009. Nutrition Handbook for Community Mobilisers.

For a sustainable diet to be achieved, the fields of agriculture and nutrition must go hand in hand in a sustainable manner. For instance, not all forms of agriculture would be conducive to a sustainable diet, such as monoculture and high-chemical-input agriculture. Approaches such as supplementation and fortification are also considered unnecessary to a sustainable diet, as shown in Table 4.2.¹⁷⁶

Table 4.2. Sustainable diets	
A Sustainable Diet	
Includes	Excludes
Agriculture, environment, health issues	Food aid
Ecosystems, biodiversity, traditions	Supplements, fortification
Food composition, nutrient requirements, food supply	Monoculture agriculture
Health and well-being	High chemical inputs
	Intensive livestock industries

Source: Burlingame, B. 2010. Biodiversity and nutrition: a common path toward sustainable diets. FAO. http://www.fao.org/fileadmin/templates/food_composition/documents/upload/commonpath.pdf

4.3.2 A diversion of resources from the best solutions

In the view of many nutritionists, the overemphasis on approaches such as supplementation leads to a clear diversion of resources away from other public health activities and food-based approaches that are more likely to provide benefit.¹⁷⁷ Some

¹⁷⁶ Burlingame, B. 2010. Biodiversity and nutrition: a common path toward sustainable diets. FAO. http://www.fao.org/fileadmin/templates/food_composition/documents/upload/commonpath.pdf

¹⁷⁷ Various authors. 2010. *World Nutrition*. Journal of the World Public Health Nutrition Association. Vol. 1, No. 2. June. <http://www.wphna.org>

Box 4.2. Food diversity to tackle micronutrient deficiency

“Vegetables and fruits are good sources not only of vitamin A but also of several other micronutrients. A balanced diet that includes adequate amounts of a variety of vegetables and other foods is the surest way of preventing micronutrient deficiencies. In India and no doubt other countries, intensive, well-structured programmes to promote the consumption of locally available inexpensive fruits and vegetables should be mounted as major national programmes and given high priority.”

Source: Gopalan, C (former Director-General, Indian Council for Medical Research, former Director, National Institute of Nutrition, India, President, Nutrition Foundation of India). 2010. Massive dose vitamin A prophylaxis should now be scrapped. *World Nutrition*. Journal of the World Public Health Nutrition Association. Vol. 1, No. 2.

of them have claimed that programmes of supplementation with vitamin A have also blocked food-based approaches for improving vitamin A status due to limited resources and the idea that the capsules have dealt with the problem.¹⁷⁸ For instance, even UN-based organizations have stated that the success of supplementation programmes and “high expectations” about fortification programmes “reduce the interest in and resources available for the promotion of dietary diversification”.¹⁷⁹ Another contributory factor is the lack of controls on the marketing of fortified products, as stated by Malang Fofana, the head of the Gambian delegation at meetings of the Codex international food standard-setting body:

“The resistance from the exporting countries to sensible controls on the marketing of these products [fortified foods] has left me very worried. Because of the move to ‘product-based’ solutions, funding is already drying up for most infant and young child feeding support programs and for community-based approaches that teach and promote

¹⁷⁸ Lois Englberger. 2010. Island food community of Pohnpei. Presentation at International Scientific Symposium on “Biodiversity and Sustainable Diets”, FAO.

¹⁷⁹ Greiner, T. 2013. Ibid.

skills to make nutritious family foods from local indigenous ingredients. I fear that once this runaway train leaves the station there will be no stopping it.”¹⁸⁰

The concerns over overemphasizing the use of vitamin A capsules were raised even at the end of the 1990s within the discussions in high-profile bodies such as the UN Standing Committee on Nutrition: “There was a lot of concern that the Vitamin A Global Initiative put too much emphasis on the distribution of vitamin A capsules.”¹⁸¹ However, the focus on VAC has continued well past the 1990s. Moreover, the UN Standing Committee itself contradicted the recommendations of the Action Plan agreed at the UN International Conference on Nutrition by considering that VAC was not only a short-term measure: “VAC is a low-cost, sustainable strategy that has been in place and effective for decades in some developing countries. Policy makers should be advised that vitamin A supplementation is not necessarily a short-term measure.”¹⁸²

VAC approaches are dominant and in 2003 the International Vitamin A Consultative Group stated that there had not been any cost-effectiveness analyses made on approaches to tackle vitamin A deficiency other than supplementation and biofortification.¹⁸³ This means that more than 10 years after the UN International Conference on Nutrition which recommended the use of locally available foods, approaches based on local foods had simply not been assessed for their

¹⁸⁰ <http://www.infactcanada.ca/whatsnew/codex-2011.html>

¹⁸¹ UN Standing Committee on Nutrition. 1999. Report of the Meeting of the Working Group on Vitamin A and Iron. April 1999. <http://www.unsystem.org/scn/Publications/AnnualMeeting/SCN26/vitamina.htm>

¹⁸² Ibid.

¹⁸³ International Vitamin A Consultative Group. 2003. Improving the Vitamin A Status of Populations. Report of the XXI International Vitamin A Consultative Group Meeting. <http://www.ilsa.org/ResearchFoundation/Publications/IVACGfinal.pdf>

cost-effectiveness. The Consultative Group recognized this in the following statement:

“Information on the relative costs and effectiveness of vitamin A programs is increasingly sought by policy makers and funding agencies. The literature on cost-effectiveness is limited to supplementation and fortification programs.”¹⁸⁴

While there are few analyses on the cost-effectiveness of dietary diversification approaches in comparison with VAC and food fortification,¹⁸⁵ some authors reaffirm that “food based approaches using locally available sources for diet diversification are the most cost effective and quickest means of providing the essential micronutrients needed for health”.¹⁸⁶

4.4 A shift of the agriculture paradigm: Agroecology

Agroecology is a scientific discipline that is gaining ground around the world and is based on practices such as recycling biomass, improving soils through green manures, mulches and biofertilizers, minimizing water, nutrient and solar radiation losses, intercropping, mixed farming with a variety of crops and farm animals, and minimizing the use of chemical fertilizers, herbicides and pesticides. Agroecologists have questioned the dominant agronomic model based on the intensive use of external inputs.¹⁸⁷ They have been critical of the effects of the industrialization of agriculture, including of the current models proposed, for instance in Africa, for a Second Green Revolution. A 2008 report from the International Assessment of Agricultural

¹⁸⁴ Ibid.

¹⁸⁵ Stokes-Prindle, C and Anderson, CL. 2010. Ibid.

¹⁸⁶ Keatinge, JDH et al. 2010. Relearning old lessons for the future of food – by bread alone no longer: diversifying diets with fruit and vegetables. *Crop Science*. Vol. 50.

¹⁸⁷ IFOAM. 2012. Agro-ecological Innovation. http://www.ensser.org/fileadmin/files/2012_IFOAM-EU-Group.pdf

Knowledge, Science and Technology for Development (IAASTD)¹⁸⁸ stressed that in order to feed the more than 9 billion people that will inhabit the Earth by 2050, there is an urgent need to adopt more sustainable farming systems. One of the key systems identified was agroecology. The IAASTD called for a fundamental paradigm shift in agricultural development to support small-scale agroecological farming.¹⁸⁹ It also stated that “business as usual is not an option”, meaning that the current toxic model of agriculture (introduced by the Green Revolution) is unsustainable.

Agroecology comprises practices that support, *inter alia*, agricultural biodiversity and also diet diversification (see Box 4.3). To achieve the changes in diets suggested in the previous sections, it is imperative to also shift the currently dominant agriculture paradigm to agroecology. Agroecological approaches can provide enough food for all in a sustainable manner.¹⁹⁰ The former United Nations Special Rapporteur on the right to food, Olivier De Schutter, has compiled evidence demonstrating that small-scale farmers – peasant farming – can double food production within 10 years in critical regions by using agroecological methods.¹⁹¹ Industrial agriculture’s main aim is profit-making agriculture, “a business like any other”, while the primary aim of peasant farming is addressing local needs

¹⁸⁸ The IAASTD was a major four-year study involving 400 experts from all regions as well as international organizations including FAO, the World Bank and the United Nations Environment Programme (UNEP). Its findings were approved by more than 50 governments in 2008.

¹⁸⁹ IAASTD. 2008. Summary for Decision Makers of the Global Report, approved by 58 governments in Johannesburg.

¹⁹⁰ De Schutter, O. 2010. Report submitted by the Special Rapporteur on the right to food. United Nations Human Rights Council, 16th session.

¹⁹¹ Ibid.

and livelihoods.¹⁹² Traditional peasant agriculture is also very rich in biodiversity and diversity of agroecosystems, notably due to a high diversity of crops grown and frequent crop rotations. In contrast, industrial agriculture is low in biodiversity and has high uniformity of farming systems, with a tendency towards monoculture.¹⁹³ Thus, the conservation of natural resources, including agricultural biodiversity, is key to agroecological practices.¹⁹⁴

Agroecology is also considered one of the pillars of food sovereignty.¹⁹⁵ The inclusion of agroecology in the broader framework of food sovereignty is “an attempt to protect peasant agricultures from the growing pressure of industrial agriculture, the whole point of agroecological farming is precisely to achieve sustainable agriculture for meeting local needs through ways that enhance the autonomy and control of peasants over their own production systems, instead of making them more dependent on off-farm inputs and external experts”.¹⁹⁶ However, despite the hundreds of successful experiences using agroecology that exist around the world, at present “the best options are simply not being promoted sufficiently by leaders at the highest political levels”.¹⁹⁷

¹⁹² Oxfam. 2014. Scaling-up agroecological approaches: what, why and how? <http://www.ikgroeimee.be/uploads/assets/332/1390912349733-201401%20Scaling-up%20agroecology,%20what,%20why%20and%20how%20-OxfamSol-FINAL.pdf>

¹⁹³ Ibid.

¹⁹⁴ PANNA. 2009. Agroecology and sustainable development. http://www.agassessment-watch.org/docs/PANNA_agroecology_Brief_20090505.pdf

¹⁹⁵ Oxfam. 2014. Ibid.

¹⁹⁶ Ibid.

¹⁹⁷ ActionAid. 2012. Fed up: now's the time to invest in agroecology. http://www.actionaid.org/sites/files/actionaid/fed_up_-_nows_the_time_to_invest_in_agroecology.pdf

Box 4.3. Types of practices typically promoted as agroecological

“Jules Pretty, from University of Essex in the United Kingdom, has highlighted seven agroecological practices and resource-conserving technologies:

1. *Integrated pest management (IPM)*, which uses ecosystem resilience and diversity for pest, disease and weed control, and seeks only to use pesticides when other options are ineffective.

2. *Integrated nutrient management*, which seeks both to balance the need to fix nitrogen within farm systems with the need to import inorganic and organic sources of nutrients, and to reduce nutrient losses through erosion control.

3. *Conservation tillage*, which reduces the amount of tillage, sometimes to zero, so that soil can be conserved and available moisture used more efficiently.

4. *Agroforestry*, which incorporates multifunctional trees into agricultural systems, and collective management of nearby forest resources.

5. *Aquaculture*, which incorporates fish, shrimps and other aquatic resources into farm systems, such as into irrigated rice fields and fishponds, and so leads to increases in protein production.

6. *Water harvesting in dry land areas*, which can mean formerly abandoned and degraded lands can be cultivated, and additional crops grown on small patches of irrigated land owing to better rainwater retention.

7. *Livestock integration into farming systems*, such as dairy cattle, pigs, and poultry, including using zero-grazing cut and carry systems.”

Source: Oxfam. 2014. Scaling-up agroecological approaches: what, why and how? <http://www.ikgroeimnee.be/uploads/assets/332/1390912349733-201401%20Scaling-up%20agroecology,%20what,%20why%20and%20how%20-OxfamSol-FINAL.pdf>

CHAPTER FIVE

A ROADMAP TO REDUCING HIDDEN HUNGER

THE fact that global and regional initiatives are created to tackle malnutrition and micronutrient deficiency is, in principle, to be warmly welcomed. The initiatives comprise a variety of actors and stakeholders, including public-private partnerships established to push specific interventions.

While the focus on nutrition is laudable, what would be more important is that the initiative is effective and the aims to reduce and eliminate certain types of malnutrition are achieved. While it is still too early to evaluate the overall success or failure of the initiatives mentioned in Chapter One, it is possible at this stage to have an overview of the interventions and the priorities of the promoters and stakeholders involved in such initiatives. It is also crucial, at this stage, to identify approaches and elements necessary to fight malnutrition adequately, which can constitute the backbone of a strategy to combat hidden hunger.

5.1 Applying a human rights approach to food and nutrition

The principle that human rights are a central pillar for action on nutrition has been gaining increased acceptance. Civil society organizations active at the Second International Conference on Nutrition (ICN2) in November 2014 declared that “the central pillar of the Decade of Action on Nutrition should be the unequivocal affirmation of the human right to adequate food

and nutrition, health, clean water, sanitation and hygienic conditions, and women's rights, including sexual and reproductive rights, among other rights".¹⁹⁸

Several international treaties such as the Universal Declaration of Human Rights, the ICESCR and the Convention on the Rights of the Child enshrine the right to not be malnourished.¹⁹⁹ Apart from this, national governments are the primary agents for the realization of human rights, and national law is a key vehicle to move this forward.²⁰⁰

In recent years, the UN, in particular the work of the UN Special Rapporteur on the right to food, has further developed the meaning and opportunities that the right to food presents to citizens around the world. The UN Special Rapporteur, for instance, has considered that hidden hunger is a violation of a child's right to an adequate standard of living or the child's physical and mental development, and to the enjoyment of the highest attainable standard of health recognized in the Convention on the Rights of the Child.²⁰¹ The right to food, which is a component of the right to a decent standard of living, places obligations on the state parties to the relevant human rights conventions:

“States have a duty to support exclusive breastfeeding for six months, and continued breastfeeding, combined with adequate complementary foods, until the second birthday

¹⁹⁸ Public interest civil society organizations vision statement on nutrition. 13 November 2014. http://www.fian.org/fileadmin/media/publications/CSO_Vision_Statement_-_Final.pdf

¹⁹⁹ See Chapter One. See also Kent (undated). The human rights approach to reducing malnutrition. Encyclopedia of Life Support Systems.

²⁰⁰ Kent (undated). The human rights approach to reducing malnutrition. Encyclopedia of Life Support Systems.

²⁰¹ De Schutter, O. 2011. Ibid.

of the child; and to establish food systems that can ensure each individual's access not only to sufficient caloric intake, but also to sufficiently diverse diets, providing the full range of micronutrients required.”²⁰²

This quote from the UN Special Rapporteur on the right to food clearly underlines the need to establish food systems that can ensure diverse diets that provide the full range of micronutrients. National policies should be established to support an adequate realization of the right to food that guarantees diverse diets.

5.2 A diversity of interventions to tackle hidden hunger: More focus needed on the permanent solution

Even though consensus exists around the fact that the permanent solution to hidden hunger is diet diversification, there are many who support the idea that none of the interventions on its own can address the problem entirely: all the remedies “do not compete but rather complement each other”.²⁰³ Along this line, the World Bank has produced over 70 country nutrition profiles which, among other things, have identified what are seen as the key actions to address malnutrition.²⁰⁴ For example, seven countries in the East-Asia Pacific region agreed that their focus areas were vitamin A supplementation, salt iodization and other fortified foods and supplements.²⁰⁵ In Africa, most of the 39 profiles created directed the focus towards several actions

²⁰² Ibid.

²⁰³ Blutner, A. 2009. Setting standards for business and development. EFFL. <http://www.food-fortification.com/Files/Download/Resources/effl-en-article-setting-standards-2009.pdf>

²⁰⁴ See World Bank. 2011-2013: <http://www.worldbank.org/en/topic/health/publication/nutrition-country-profiles>

²⁰⁵ World Bank. 2011. Philippines – Nutrition at a glance. <http://documents.worldbank.org/curated/en/2011/04/17694776/philippines-nutrition-glance>

such as increasing coverage of vitamin A, achieving universal salt iodization and improving dietary diversity.²⁰⁶

While the World Bank-led exercise to rationally implement different interventions is not wrong in principle, it is possible that investing in a range of interventions results in a diversion of much-needed funding and resources from the more adequate options, and proper prioritization is not made. It could also be the case that development funds respond to a “pick and choose exercise” by the donors according to their interests and priorities. Which of the interventions will be prioritized? Will enough effort be expended on the most sustainable and permanent solution, which is diet diversification?

It must be noted that diet diversification through locally available foods was a key strategy agreed at the 1992 UN International Conference on Nutrition; however, several studies conducted a decade later concluded that most of the work in that area was limited to pilot projects. Supplementation and fortification have been the predominant interventions employed in the fight against hidden hunger, and several authors indicated that such an approach has led to resources being diverted to short- and medium-term solutions rather than the long-term and permanent solution, i.e., diet diversification.

It is important to use the human rights approach as a means to address the underlying causes of malnutrition and to re-focus action on diet diversification. For instance, a statement presented by civil society at ICN2 was critical of the most common approaches used in recent years, such as VAC and ready-to-use therapeutic foods:

²⁰⁶ World Bank. 2011. Cameroon – Nutrition at a glance. <http://documents.worldbank.org/curated/en/2011/04/17689197/cameroon-nutrition-glance>

“We urge Member States to address the underlying causes of malnutrition, so that existing product-based approaches (e.g., vitamin A capsules, ready-to-use therapeutic foods) can be limited and possibly phased-out in favor of human rights- and food-based, local, bottom-up, capacity-building approaches for the prevention of all forms of malnutrition at the community level.”²⁰⁷

5.3 Avoiding over-emphasis on fortification

A closer look at the actors and initiatives within the SUN Movement shows a preference for food fortification as the main approach in the fight against malnutrition in developing countries.²⁰⁸ The specific nutrition interventions that the Movement seeks to implement are: “Support for exclusive breastfeeding up to 6 months of age and continued breastfeeding, together with appropriate and nutritious food, up to 2 years of age; Fortification of foods; Micronutrient supplementation; and Treatment of severe malnutrition.”²⁰⁹ Diet diversification is not explicitly listed as a specific intervention; however, it might be implicitly addressed under SUN’s “nutrition-sensitive approaches” within the agriculture sector.

In any case, if we look at the SUN Movement’s “examples and best practices” of private sector engagement, which involve public-private partnerships with organizations and companies such as the World Food Programme (WFP), Unilever, Kraft Foods, DSM – one of the world’s largest producers of micronutrients –

²⁰⁷ Public interest civil society organizations vision statement on nutrition. 13 November 2014. http://www.fian.org/fileadmin/media/publications/CSO_Vision_Statement_-_Final.pdf

²⁰⁸ Lawrence, M. 2013. Ibid.

²⁰⁹ See Scaling Up Nutrition webpage: <http://scalingupnutrition.org/about>

and GAIN, fortification features prominently.²¹⁰ WFP and DSM have a specific line of cooperation on hidden hunger, and DSM states on its webpage that it is “heavily involved with the World Food Programme in the fight against ‘hidden hunger’”.²¹¹ Most of the private sector engagement examples focus on fortification and supplementation and barely any effort is explicitly and directly related to diet diversification interventions through locally available foods.²¹² A SUN report also recommends “mandatory fortification” as a way to “deliver a sustained source of fortified food for consumption and a public health benefit”.²¹³

The SUN Movement has been criticized by both government and non-governmental actors. For instance, while it says that it promotes government-led initiatives, “its fundamental approach is entrenched in the frequent donor-driven emphasis on market-led ‘products’ and high-tech solutions to malnutrition, rather than on community-based solutions rooted in human rights and equity”.²¹⁴ Moreover, the critics also point to the corporate-driven approach of the Movement: “While businesses can play a role in development, their fiduciary duty lies first with shareholders, not with public health. SUN’s promotion of partnerships with businesses thus provides corporations with unprecedented opportunities to influence national, regional and global policies.”²¹⁵

²¹⁰ SUN. 2011. Private sector engagement toolkit. http://scalingupnutrition.org/wp-content/uploads/2012/09/Private-Sector-Engagement-Toolkit_0909112.pdf

²¹¹ See DSM webpage: <http://www.dsm.com/corporate/about/our-company/what-we-do.html>

²¹² SUN. 2011. Ibid.

²¹³ Scaling Up Nutrition. 2013. Draft. State of the SUN Movement. Progress Report. http://scalingupnutrition.org/wp-content/uploads/2013/09/SUN_Progress_Report_2013_ENGLISH1.pdf

²¹⁴ Right to Food and Nutrition Watch. 2013. Alternatives and resistance to policies that generate hunger. http://www.rtfn-watch.org/fileadmin/media/rtfn-watch.org/ENGLISH/pdf/Watch_2013/Watch_2013_PDFs/Watch_2013_eng_WEB_final.pdf

²¹⁵ Ibid.

Some countries have also maintained a sceptical position on SUN. South Africa, for example, has not joined the list of SUN countries²¹⁶ because, according to anonymous officials, SUN “is overly focused on packaged interventions such as ready-to-use therapeutic foods. These approaches seem to be donor-driven, and would not suit the country’s needs”.²¹⁷

The previous paragraphs at the least indicate that the private sector has a solid preference for fortification and supplementation interventions, rather than interventions based on diet diversification through locally available food. In the “Nutrition for Growth” conference in London in 2013, most of the preferred interventions were related to fortification and breastfeeding, and very few actors explicitly raised the need for a large-scale intervention at country level on diet diversification. Some of the proposals moved towards territory still little known in the field of nutrition, such as genetically engineered crops that address malnutrition, although knowledge about the health, environmental and socio-economic impacts of such crops is scarce. For example, the UK Biotechnology and Biological Sciences Research Council committed itself to working with CGIAR’s HarvestPlus to organize a UK and international scientific workshop on next-generation biofortified crops and bioavailability in 2014.²¹⁸

Other organizations and programmes are also increasing efforts on biofortified GE crops. Under its programme for research on nutritious and safe foods, the US government’s Feed the Future

²¹⁶ See list of countries at: <http://scalingupnutrition.org/sun-countries>

²¹⁷ IRIN. 2012. Food: nutrition getting the attention it deserves? <http://www.irinnews.org/report/96671/food-nutrition-getting-the-attention-it-deserves>

²¹⁸ DFID. 2013. Nutrition for Growth commitments: Executive summary. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/207274/nutrition-for-growth-commitments.pdf

initiative is supporting the research and development of Golden Rice.²¹⁹ The Gates Foundation is working closely with USAID – which leads the Feed the Future initiative – in the development of Golden Rice as well. Moreover, the Foundation is financing efforts to genetically engineer crops such as banana, sorghum and cassava in Africa through different partners, as seen in detail in Chapter Three.

In any case, the promoters of fortification advise that the fortification of staples does not substitute for diet diversification:

“It is very important that you and your family keep on eating other types of food. Fortified white and brown bread flour (from which bread is made) and maize meal cannot supply all the micronutrients your body needs for optimum health. It is very important to eat a variety of food, including plenty of vegetables and fruit every day – they provide lots of micronutrients and fibre that is necessary for regular bowel movements and the prevention of diseases such as colon cancer.”²²⁰

Finally, the concerns over mainstreaming fortification were also raised recently at ICN2, as seen in Box 5.1.

²¹⁹ See http://feedthefuture.gov/sites/default/files/resource/files/ftf_factsheet_fsicnutrition_nov2013.pdf. See also http://feedthefuture.gov/sites/default/files/resource/files/ftf_factsheet_fsicscaling_nov2013.pdf

²²⁰ Department of Health South Africa. Why do we need to fortify our food? <http://www.sahealthinfo.org/nutrition/foodguide.pdf>

Box 5.1. Agrobiodiversity and community capacity building as key drivers of dietary diversity and nutritional well-being

The following is an excerpt from a statement issued by civil society groups that were actively involved in the run-up to the Second International Conference on Nutrition in November 2014:

“We are deeply concerned at any approach that promotes food fortification as the main path to address nutritional imbalances and purely technological fixes that do not recognize the social determinants of preventable malnutrition. Biodiversity loss – especially loss of diversity within crops and some animal species – is in itself an important cause of malnutrition. In this respect, agrobiodiversity and the development of new plant varieties need to build on traditional methods and approaches that protect native seeds rather than engaging in forms of genetic modification that may present grave consequences for biodiversity and food sovereignty. Farmers must also be protected against the contamination risks that GM [genetically modified] crops might cause to conventional varieties and the associated contamination with agrochemicals, while it is necessary to emphasize policy and research support to a vibrant, public, plant breeding and conservation agenda led by farmer-researchers.”

Source: Public interest civil society organizations vision statement on nutrition. 13 November 2014. http://www.fian.org/fileadmin/media/publications/CSO_Vision_Statement_-_Final.pdf

5.4 Moving forward with a roadmap to tackle hidden hunger: Putting diet diversification at the centre

In the past 20 years, the majority of interventions to reduce hidden hunger seem to have followed the precept of calling for a bit of everything, but with predominance placed on the practices of supplementation and fortification. However, these interventions in developing countries have raised some doubts and criticisms, as described in Chapters Two and Three.

Of the three main interventions, in the past two decades diet diversification has been the least employed, and specialists have observed that the use of supplementation and pursuit of fortification interventions have diverted resources and efforts away from diet diversification. At present, the path taken by major initiatives is prioritizing fortification – including biofortification, by both conventional and transgenic means – consigning the diet diversification approach to a lesser or negligible role once again.

This occurs despite the fact that many organizations have already concluded that there are better alternatives to deal with malnutrition than biofortification. For example, in the view of ODI and a group of development NGOs,²²¹ at present, home gardens are probably a better route to more diversified diets than methods such as biofortification. Indeed, one of the interventions leading to diet diversification is the promotion of home gardens and small-scale livestock rearing. On this topic ODI states:

“Since gardens and small-scale livestock are often carried out by women – being close to the house can make them more compatible with women’s time, they tend as well to empower women giving them more incomes and status. Evaluations in several countries show that households that have improved home gardens have higher production of micronutrient-rich foodstuffs, higher consumption of these, and increased sales in local markets. Children’s nutrition

²²¹ The NGOs include Christian Aid, Care, Save the Children and others. See UK Hunger Alliance (undated). Small scale, big impact: Smallholder agriculture’s contribution to better nutrition. http://insights.careinternational.org.uk/media/k2/attachments/HA_small_scale_big_impact_FINAL_April_2013.pdf

often improves: effects that are stronger when these programmes are combined with education on diet, child care and hygiene.”²²²

Home gardens are one of the well-known strategies to combat micronutrient deficiencies in the developing world. Agroecology is also important for its role in diversifying diets, and has demonstrated clear benefits for small-scale and family food producers in particular.²²³

However, on a global basis, funding for these strategies has been very low in comparison with other approaches. There is a risk that, if the levels of support for diet diversification are not increased, the so-called long-term and permanent solution will never materialize. It is not enough to do a bit of everything. The permanent solution needs to be seriously pursued. There is a need to elaborate country roadmaps on a case-by-case basis that design concrete methodologies and channel efforts towards guaranteeing sustainable diets for country populations. While a combination of interventions might be used in a certain country, diet diversification interventions need to be at the centre of the fight against hidden hunger.

²²² ODI. 2013. Ibid.

²²³ Public interest civil society organizations vision statement on nutrition. 13 November 2014. http://www.fian.org/fileadmin/media/publications/CSO_Vision_Statement_-_Final.pdf

Tackling Hidden Hunger

Putting Diet Diversification at the Centre

THE scourge of "hidden hunger" or micronutrient deficiency affects around two billion people worldwide who lack adequate intake of vitamins and minerals in their diet. While several international and regional initiatives are underway to combat malnutrition, and specifically micronutrient deficiency, these have largely focused on the approaches of nutrient supplementation and food fortification at the expense of dietary diversification, considered the most durable solution to hidden hunger. The development of nutritionally enhanced genetically engineered crops, such as "Golden Rice", has further attracted controversy and raises serious biosafety concerns.

For a global strategy on nutrition to be successful, this book argues, it must place central emphasis on diversifying diets. Towards this end, sustainable farming practices based on agricultural biodiversity, such as agroecology, are key to providing the rich variety of foods that will keep hidden hunger at bay.

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