



## Role of Agriculture in Improving Nutrition and Fighting Malnutrition

### KEYWORDS

food security, malnutrition, policies, strategies

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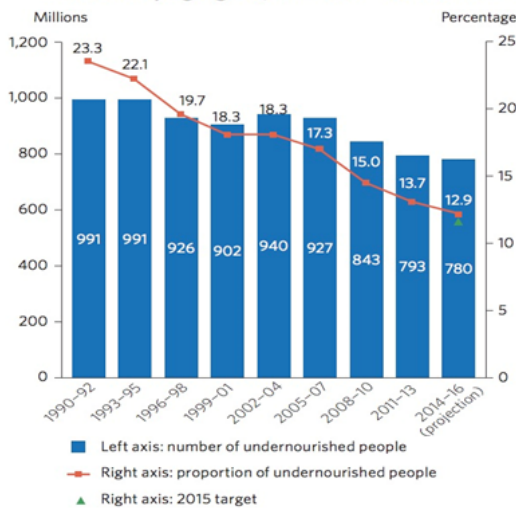
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**ABSTRACT** This review paper explores the interrelationships between, foods, health, agriculture and environment policies in addressing malnutrition. Evidence on the agri-nutrition pathways reflects both the importance of agriculture for nutrition and the conditionality of that importance on contextual factors due to insufficient high quality research on these linkages. Agricultural and food policies could also be formulated to promote the household consumption of micronutrient-rich foods. Linking community development policies to national programmes, increasing the variety of foods, access and consumption and focussing on gender constraints is the best strategy for improving malnutrition sustainably. This paper will be used as a reference material in planning an effective agri-based nutrition program with proper monitoring and evaluation; improve agriculture and food policies, their formulation and planning; coordination among various sectors. In Summary, sustainable health intervention programs can be built on the concepts and strategies proposed here.

### Introduction

**Fig 1. Number and proportion of undernourished people in the developing regions, from 1990–1992 to 2014–2016**



The Millennium Development Goals Report of United Nations states that the proportion of undernourished people in the developing regions has fallen by almost half since 1990, from 23.3 per cent in 1990–1992 to 12.9 per cent in 2014–2016 for the details after fig 1. However, the same report recognises that big gaps exist between the poorest and richest households, and between rural and urban areas. Statistically speaking, about 795 million people are undernourished globally. This means that nearly one in nine individuals do not have enough to eat. The vast majority of them (780 million people) live in the developing regions; Southern Asia faces the greatest hunger burden, with about 281 million undernourished people. There are over 90 million children under age five—one in seven children worldwide—remain underweight; Two regions account for nearly 90 per cent of all overweight children in 2015—half live in Southern Asia and one third in sub-Saharan Africa<sup>1</sup>.

While the evidence for appropriate health sector policies and services supporting nutrition is strong, the equivalent evidence regarding appropriate policy choices linking agriculture via food systems to consumer choices resulting in high quality diets remains weak<sup>2</sup>.

Food systems are changing rapidly around the world. Interactions among production systems, markets, consumer demand, and retail systems are dynamic. A much-improved understanding is needed of how various policy interventions might affect (positively or negatively) the quality and quantity of foods reaching local food environments. Food choices that people are able to make determine the quality of diets that are key to good nutrition. Food choices are framed by the local context of food availability, accessibility, affordability and appeal.

A renewed focus on agriculture is soon realized and agricultural policies programmes to become nutritious sensitive. Agriculture interventions can contribute to improving nutritional health. It does not consider agriculture linkages to over nutrition, obesity and associated Non Communicable diseases as these issues does not feature in the MDGs and progress on their achievement. This is followed by an examination of evidence on the impact of agricultural development and development interventions on nutrition<sup>3</sup>.

### What are the nutrition / health issues in the MDGs/SDGs that are most closely linked to agriculture?

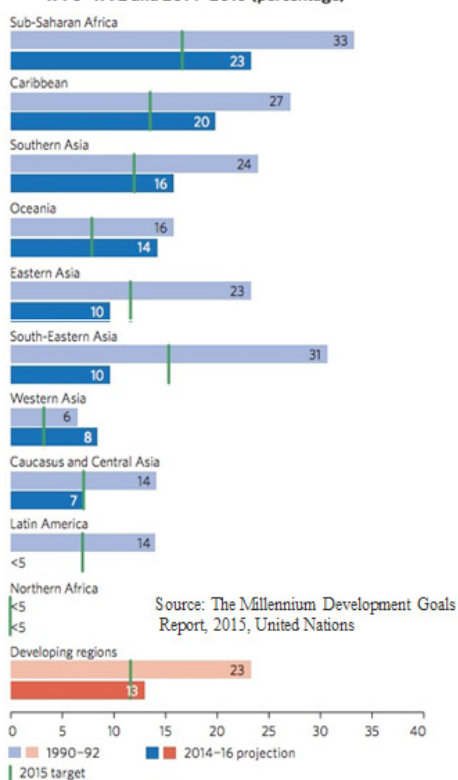
The Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs) differ with respect to their focus and underlying philosophies. The MDGs on the one hand the agenda of reducing poverty in developing countries in its various dimensions (lack of income, education, water, political participation etc.). The SDGs on the other hand, the idea of sustainability generated a parallel concept to the MDGs. The public is beginning to sense that the increasing frequency of extreme climate events is indicative of an underlying dangerous trend of long-term change. Moreover, the growing burdens of high and volatile food prices are confronting billions of people daily. Beyond the environmental threats, humanity faces other serious threats that are a part of the sustainable development

agenda<sup>4</sup>.

Sustainable development is eluding the entire planet. The SDGs pose goals and challenges for all countries—not what the rich should do for the poor, but what all countries together should do for the global wellbeing of this generation and those to come. The SDGs have three bottom lines, growth and environmental sustainability; vulnerabilities to adverse trends such as climate change; and rising geopolitical roles, regionally and globally but achievement of any of them is likely to need concerted global efforts to achieve all of them. Moreover, the three bottom lines will depend on a fourth condition: good governance at all levels, local, national, regional, and global<sup>7</sup>.

Health is central to the three dimensions of sustainable development. Health is a beneficiary of and a contributor to development. It is also a key indicator of what people-centred, rights-based, inclusive, and equitable development seeks to achieve<sup>5</sup>. Health is important as an end in itself and as an integral part of human well-being, which includes material, psychological, social, cultural, educational, work, environmental, political, and personal security dimensions. These dimensions of well-being are interrelated and interdependent. Investments in health, particularly prevention of ill health, enhance a country's economic output through their effects on educational achievement and skills acquisition, labour productivity and decent employment, increased savings and investment, the demographic transition and impacts on the earth's ecosystem<sup>6</sup>.

**Fig 2. Proportion of undernourished people, 1990–1992 and 2014–2016 (percentage)**



Let us see the achievement of health worldwide under the MDGs: In 2001 in United Nations, eight goals with eighteen associated targets and 48 indicators specified. The principal goal targets are eradication of extreme poverty and hunger. Between 1990 and 2015, the proportion of

people who suffer from hunger estimated will be half. The Achievement and non-achievement of MDG targets based on two indicators, first, Prevalence of underweight children younger than five years and second, proportion of populations below minimum level of dietary energy consumption. In Western Asia, Eastern Asia Caucasus, Central Asia and Latin America, Caribbean, North Africa, and 'south eastern asia target achieved but' undernourishment is unlikely to be met by 2015<sup>1</sup>.

The incidence of hunger and undernourishment remain a concern. Undernourishment in the developing country shows variables to up and downs to meet the MDGs target (Fig 2)

There are wide variations between regions as regards changes in prevalence and numbers of undernourished people. Under nourishment and hunger should be monitored with a wide range of indicators of food availability, access and utilization. There is insufficient progress to meet targets of two third reductions in child mortality or in halving the proportion of the population without access to improved sanitation.

The Sustainable Development Goals is a set of 17 goals but the 12 principle goals are relevance to nutrition. The SDGs with crosscutting issues that is the focus of this paper is discussed as follows (Table 1):

Table 1: SDGs with its crosscutting issues	
SDGs	Cross –cutting issues
Goal 01. End poverty in all its forms everywhere including hunger achieve food security and improved nutrition	Food security and nutrition; Gender equality; Global partnership including financing for sustainable development; Health; Inequalities; Peace and security; support for vulnerable states; Sustainable energy for all; Water and Sanitation
GOAL 02: Improve and promote sustainable Agriculture Systems and Raise Rural Prosperity	Climate change adaptation and mitigation; disaster risk reduction; Food security and nutrition; Gender equality; Growth and employment; Health; Inequalities; Industrialization; Science, technology, and innovation; Sustainable consumption and production (SCP); Sustainable energy for all; Sustainable land use, forests and other terrestrial ecosystems; Sustainable management of oceans and coastal areas; Water and Sanitation
GOAL 03: Achieve and ensure Health and Wellbeing at all Ages	Beyond GDP - new measures for development; Food security and nutrition; Gender equality; Health; Inequalities; Sustainable consumption and production (SCP); Water and Sanitation
GOAL 04 : Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Gender equality; Growth and employment; Health; Inequalities; Industrialization; Science, technology, and innovation; Water and Sanitation
GOAL 05: Achieve Gender Equality, Social Inclusion, and Human Rights, empower all women and girls	Gender equality; Governance; Growth and employment; Health; Inequalities; Peace and security; support for vulnerable states
Goal 6. Ensure availability and sustainable management of water and sanitation for all	Sustainable management of oceans and coastal areas water and sanitation, health and hygiene. Science, technology, and innovation; Governance for all

GOAL 07: Empower Inclusive, Productive and Resilient Cities Livelihood	Climate change adaptation and mitigation; disaster risk reduction; Food security and nutrition; Gender equality; Global partnership including financing for sustainable development; Governance; Growth and employment; Health; Inequalities; industrialization; Peace and security; support for vulnerable states; Science, technology, and innovation; Sustainable consumption and production (SCP); Sustainable energy for all; Sustainable land use, forests and other terrestrial ecosystems; Sustainable management of oceans and coastal areas; Water and Sanitation
GOAL 08: Promote inclusive and sustainable economic growth And Decent Jobs for all	Beyond GDP - new measures for development; Climate change adaptation and mitigation; disaster risk reduction; Gender equality; Global partnership including financing for sustainable development; Growth and employment; Health; Inequalities; Industrialization; Sustainable consumption and production (SCP); Sustainable energy for all; Sustainable land use, forests and other terrestrial ecosystems; Sustainable management of oceans and coastal areas; Water and Sanitation
GOAL 10: Reduce inequality within and among countries, Transform Governance and Technologies for Sustainable Development	Beyond GDP - new measures for development; Climate change adaptation and mitigation; disaster risk reduction; Food security and nutrition; Gender equality  Global partnership including financing for sustainable development; Governance  Growth and employment; Health; Inequalities; Peace and security; support for vulnerable states; Science, technology, and innovation; Sustainable consumption and production (SCP); Sustainable energy for all; Sustainable land use, forests and other terrestrial ecosystems; Sustainable management of oceans and coastal areas; Water and Sanitation
GOAL 13: Take urgent action to combat climate change and its impacts and ensure sustainable energy	Climate change adaptation and mitigation; disaster risk reduction; Gender equality; Global partnership including financing for sustainable development; Health; Inequalities; Industrialization; Sustainable consumption and production (SCP); Sustainable energy for all; Sustainable land use, forests and other terrestrial ecosystems; Sustainable management of oceans and coastal areas
GOAL 14 & 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss for sustainable development	Climate change adaptation and mitigation; disaster risk reduction; Global partnership including financing for sustainable development; Governance; Inequalities; Sustainable consumption and production (SCP); Sustainable land use, forests and other terrestrial ecosystems; Sustainable management of oceans and coastal areas; Water and Sanitation

Source: Indicators for sustainable development ,UN,2014

Target under SDGs can only be achieved if the full potential of agriculture development to improve human welfare is recognized and channelled properly. This will require that the multiple roles of agriculture be recognized, and that the diverse opportunities to deal with the many social and economic issues. In the context of the MDGs this translates into people-centred development or "putting people first" and means looking beyond food availability

and incomes as the primary objectives of agriculture development or as the sole determinants of food security. It re-directs agriculture to focus on the livelihoods of the poor, and gives priority to looking at farmers, households and communities - not just at crops, livestock, fish and forests. It places issues of food, food security and agriculture firmly within the framework of social and economic development and recognizes that in addition to food supplies, prices and incomes, people's knowledge, preferences and attitudes, coupled with social pressures and time constraints, are also critical factors affecting their food security.

First, all forms of malnutrition need to be addressed, not just hunger or the lack of sufficient food to meet energy needs; and second, the pro-poor aspects of the interventions are best assured by using a participatory, community-based approach that aims to improve the nutrition and food security of the poorest and most vulnerable segments of the population within the context of securing sustainable livelihoods.

The majority of the MDGs refer to improvements in the wellbeing of individuals, they are thus final goals of human development (education, health, access to water) to be measured at the micro-level. The SDG agenda also involves such goals (clean air, biodiversity), but also ones that refer to the preservation or establishment of global public goods (limiting climate change, financial stability) that can thus only be measured through macro indicators. The latter are not objectives, but preconditions for sustainable development that for reasons of consistency should not enter into one agenda with final goals. Some of these are already addressed by MDG 8 (among them a fair financial and world trade system).

Finally, MDGs and SDGs are not competing concepts – the SDGs, correctly formulated, will accelerate and continue the work begun under the banner of the MDGs, achieve greater economic and social inclusion, and also emphasize the integration and balance among economic, social and environmental aspirations. Thus, there is a unified, people-centred development agenda, with sustainable development at its centre. The MDGs are mostly inspired by improving the living conditions of the poorest people; the SDGs main concern is shaping development sustainably.

Interlinkages between SDGs and the cross cutting issues especially relevance to eradicate nutrition and poverty are grouped as below:

**Goal 1 and 2: Increase support for agriculture and food security:** Food insecurity and poor nutritional status are correlated with poverty and social inequity to fight poverty, alleviate malnutrition, ensure food security and promote sustainable livelihoods.

**Goal1, 8 and Goal 13: Creating jobs and expanding social safety nets:** Safety net programs have always been sensitive to the business cycle and have become significantly more responsive to economic cycles in the wake of welfare reform. However, by keeping the unemployed out of poverty during downturns, help to maintain family wellbeing in the low-skill sector, which may increase employment and reduce poverty in the long run. Use safety nets and nutrition programs to cushion the impact of the food and financial crises

**Goal 3:** expanding nutrition programs that target children under 2 years of age

**Goal 4: universalizing education:** Education is linked to early childhood development, for which nutrition is of vital importance. Nutrition status in first 1,000 days is linked to school grade completion and achievement, empowered in work force and the wider society.

**Goal 5, 7, 8 & 10:** Promoting gender equality

**Goal 10 &13: protecting vulnerable countries during crises:** Millions of workers lose their jobs in economic crises, natural disaster or climate change. Food price spikes put basic staple foods out of the reach of the poor. Governments often feel compelled to act in such situations. Yet delivering early support to those suddenly in need requires systems that elude most developing countries. In principle, unemployment insurance to protect workers against job loss, disaster insurance for homeowners, and crop and livestock insurance for farmers are good solutions because they can be automatic, self-financing, and disburse rapidly. Yet because of informality and missing markets, most workers, homeowners, and farmers lack insurance or the benefit period of insurance are very short. Keeping health, education, and vocational training free (or at least affordable) during crisis helps maintain enrolment, use of health services, and human capital. Countries should prepare for shocks by strengthening their ability to protect people's basic consumption and access to health and education during bad times. Programs for income support should be put in place during good times, along with fiscal frameworks to permit transfers and social services to continue uninterrupted during bad times. Income support programs need to be scalable and flexible to increase coverage in response to shocks and scale back once crises abate. Their targeting systems need to emphasize the shock-affected, not just the chronic poor.

**Conceptualizing Causal Pathways from Agriculture to Nutrition**

Most of the recent reviewers of the evidence of impacts of agriculture on nutrition have organised literature searches and analysed around theorized causal pathways that build on the understanding that 'Food alone' is not enough.

The UNICEF and FAO conceptual framework developed 25years ago with a common theme focussing on dietary adequacy in the context of improved health is needed to improve nutritional status. As per CGIAR 1996 higher calorie intake from same crop improves the nutrition and health<sup>7</sup> but understanding of what 'adequate' means has changed over time. It was in the early 1990s the focus is towards enhancing the productivity of the crops grown by smallholders' who were assumed to benefit nutritionally from consuming more of these same crops.

In the late 1990s the intervention strategies shifted toward tackling specific nutrient deficiencies through biotechnology but soon it took off, based on premise that higher levels of micronutrients in the targets crops would meet the needs of the people deficient in those nutrients<sup>8</sup>. Agri technologies/resource increase both agri production and food availability per works. This lowers the cost and price of food relative to worker incomes and increase real incomes and other discretionary spending. In early 2000 intervention /strategies developed to understand "how agriculture affects human health and nutrition". Earlier all the above factors are non-conceptual. Food security is often considered as calorific supply.

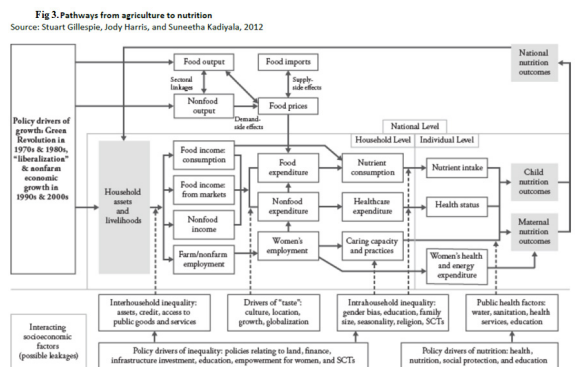
Similarly, the frameworks developed by Hawkes et al.

(2012) and Chung (2012) highlighted, micronutrient deficiency versus anthropometry, nutrient quality (bioavailability), value chain parameters, and the creation of demand for health services through knowledge and education<sup>9,10</sup>.

According to SPC and CGIAR (2012)The decision to focus on human impacts allowed for greater discussion of cross cutting issues crucial to nutrition, including gender and intrahousehold resource control, food safety, disease nutrient interactions, and even the appropriateness of metrics used to assess agriculture supported outcomes<sup>11, 12</sup>.

In other words, connecting all thoughts and the links in one pathway represents a priority for future research. Only then can a full pathway be empirically documented, and its cost-benefit likely (cost and effectiveness at field level) be compared with alternative or complementary actions. Importantly, a lack of 'linkage research' aimed at uncovering mechanisms linking elements of a chain is arguably the defining feature of all work in this domain so far. Each of the reviews of evidence of linkages of the past decade has concluded that too many studies rely on "simplistic associations" and too few "include all the necessary aspects of the research chain"<sup>11</sup>.

In the year 2012 a new concept arose combining the UNICEF and FAO concepts, which identify key issues, requires for more explicit attention including drivers of taste in dietary choices, seasonality, women's health (not just the child's), food environment and the role of sanitation<sup>13</sup>. Black colour used for text is not very dark as other text and so after taking out print out the text are very light black towards grey. Advised to use the equal/same text



**Three broad pathways by which Agri imparts on nutrition:**

- A general development
- An own production
- Production

Linkages between agriculture and food security as discussed above depends on the availability and its utilization:

- Food security exists if availability is there,
- Access- local unavailable but availability be overcome by purchase,
- Utilization-depends upon food storage and processing, physiological processes of nutrient absorption, and
- Stability needed in expected food access hence stability in availability
- The immediate problem is that many of the links across most of the pathways remain poorly understood.

### The conceptual model identifies three levels of causality:

- Immediate causes that act on the individual.
- Underlying causes that act on households and communities.
- Basic causes that act on entire societies but have a greater or lesser impact on specific groups within society.

### Nutrition and Health: Big Challenges Ahead

Agriculture has succeeded in massively increasing the amount of staple grains produced, but the world still faces serious challenges related to nutrition and health risks to both food producers and food consumers. Health risks include microbial and other pollutants from waste-water irrigation, exposure to zoonotic pathogens, aflatoxins and chemicals like pesticides and herbicides, etc.

High agricultural growth has done little to improve nutrition because it was driven primarily by crops that poor people were less likely to grow due to the lack of financial resources and technologies required to grow export crops. Agricultural growth, in particular, is associated with increases in calorie consumption, depending on the size of the agricultural sector in a country, but it does not necessarily result in more diverse diets and hence lack important key micronutrients from people's diet<sup>14</sup>. Hence promote diversification of agriculture into nutritious and high-value products like horticulture, and fish, which offer great potential for small farmers because they are, land saving and labour intensive. A more diverse and productive agricultural system will in turn accelerate growth in the rural nonfarm sector, in areas like agro-processing.

Following steps need to be addressed to eradicate malnutrition and represent critical mechanism in supply to impact.

- Co-ordinated action in Agriculture for nutrition improvement.
- High quality empirical research investigating conceptual linkages among Agri nutrition-Health
- Nutrition sensitive agriculture for improved nutrition
- In getting policy and political commitment to bridge across traditionally separate disciplines and sectors which are enshrined in often competing bureaucratic structures in government, research organisations and other agencies in different bodies of knowledge and world views in different career and incentive structures for staff and is sect oral funding allocations.
- Greater achievement in gender empowerment (especially women)
- Challenges in getting changes in food security system that impact the critical 'Thousand Days' for conception or limits to benefits from bio fortification of staples where infants do not consume enough to get sufficient nutrient benefits even after bio fortification
- Rising food prices, climate change and threats of water scarcity
- Maximise linkages between nutrition and agriculture and health
- Government, civil society, private sector, should draw from global/regional and nutritional case studies and scale up their investments in nutrition and health friendly agricultural policies and projects.

### Gender dimensions of agriculture, nutrition and health

For scaling up nutrition-oriented Agriculture, a women farmer centric approach needed to be taken, because the

women farmers contribute to the agriculture production in critical ways, such as;

- They carry out bulk of the farm labour activities and food processing in many countries. Prepare food, care for children/household members who fall sick.
- They sell and buy nutritious products from local farmers or local markets.
- They carry out these works without the benefit of credit, Access to health care, child care, secure right to land and water, sound information about Agri- Production, health and nutrition.
- Women's control of income from Agricultural and non-agricultural sources is an important factor in nutrition outcomes of children.
- When directing more tools and resources for women. It is necessary to handover them, full right and disposing power for caring indoor/outdoor issues.

Mainstreaming gender considerations into agriculture-based programmes is essential to increase their nutrition sensitivity. However, it is equally important to take a "do no harm" approach which guards against unintentional negative consequences of interventions that target women. In addition to the issue of time allocation, other risks include gender-based violence as well as the ill health effects that can come from working in unsafe agricultural environments. As mentioned above, zoonotic disease is one example.

### Nutrition-Sensitive Agriculture Project and Programme Planning Design

The interventions designed to improve agriculture often focus on increasing the yield of the staple crops. But a much greater impact on nutrition can be achieved by shifting the main focus to increasing the variety of nutrient-rich foods produced and consumed by smallholder farm families. This requires explicitly building nutrition objectives into agriculture programme designs, empowering women smallholder farmers, and incorporating nutrition education with agriculture interventions. For example, how the promotion of particular crop affects women in terms of their time or income, how production affects the environment or how climate change affects the crops, and what other actors need to be involved. Design activities to address these factors, including coordination with other key actors, to help the project in its efforts to improve nutrition<sup>15</sup>. In order to design such an impressive Gender Mainstreaming in Agriculture for Nutrition- intervention strategy following things should be taken in consideration:

- Conduct ex-ante gender analyses prior to programme and project design
- Include a gender expert or focal point in the planning team to ensure that interventions are women and nutrition-sensitive.
- Promote gender assessments in formative research, monitoring, impact evaluations, reporting, and other core or ancillary activities
- Monitoring & Evaluation
- Include gender-specific objectives, indicators and targets to encourage reporting on gender-related impacts and progress in empowerment.
- Disaggregate data by sex and age groups where possible (implies investment in country level systems that allow for this disaggregation and their dissemination).

In order to avoid these unintended consequences, identi-

cation and tracking of potential "gender harms", together with development of a feasible mitigation plan, are essential to agriculture programmes aspiring to nutrition sensitivity<sup>16,17</sup>.

### **International Policy and legal frameworks, protocols and programs**

Agricultural and food systems throughout the world have evolved to become more complex and globalized. Nutrition-sensitive agriculture aims to maximize the positive impact of the food system on nutrition outcomes while minimizing any unintended, negative consequences of agricultural policies and interventions for the consumer. Food and agriculture policies and programmes have a major role to play in improving a country's nutritional outcomes<sup>18</sup>.

Many country policies did not emphasize interventions to improve processing, storage, marketing and utilization of foods. Very few have assessed impact of their policies on nutrition outcomes. Major policies often include nutrition objectives, but there is a tendency to prioritize explicit sector priorities within ministries at the expense of nutrition.

Policies and programmes are clearly relevant, but the tangible impact of food processing, storage, and transformation, into improvements in dietary patterns and nutritional outcomes is fragmented. Debate continues between those who argue that agricultural policy should play a large role in producing nutritious food and those who believe that it is more important for agricultural policy to focus on economic development and "feeding the planet" in the form of bulk calories.

At this stage of time it is important to contribute to the on-going dialogue of the gaps in our understanding of effective nutrition sensitive agriculture and food policies and commitments, and the food-based solutions that help inform countries in their efforts to scale up nutrition.

Many countries have done a fair job in increasing incentives to diversify production access and consumption of nutritious foods but more can be done. Most countries lack the ability to measure and monitor consumption patterns and dietary diversity. One reason is due to disjointed information systems across ministries, but there is also a lack of tested, validated indicators to measure diverse, quality consumption and food composition databases are often out dated or non-existent.

Most countries have done well in empowering women through their agriculture and social protection policies and investments. Capacity remains a gap – from community to university levels-- in almost all the countries. Multi sectoral strategies and true integration across sectors is a mixed bag. Some countries have good intent to coordinate but intent and action are world apart. A few countries are doing actual work across sectors, whereas a very few, engage very little across sectors

Almost all of the policies focus on increasing food production, which is the mainstay of modern agriculture. Throughout most of the policies there is also an emphasis on women-led and - engaged agriculture. Bolstering the engagement of women on an economic and developmental level within agriculture is increasingly recognized as an important investment for countries and targeting women has strong evidence for improving nutrition outcomes at the household level.

Some countries' policies did not emphasize post-harvest storage, processing and attainment of nutritional quality of commodities and nutrition-sensitive value chains are not well framed.

It is clear that better capacity and understanding would benefit every country. Governments that achieve significant gains in nutritional outcomes through improving agricultural policies and programs will be at the vanguard of a new methodology and have the opportunity to significantly contribute to learning in this area.

The pressures of population growth, urban migration, and environmental risk and climate volatility, as well as the movement of ideas and technology freely across borders in an increasingly globalized planet will all play a role in those production and consumption patterns.

Many of the food and nutrition security policies analysed incorporate agricultural objectives, but this was not generally reciprocated. Most of the agricultural policies focus primarily on economic productivity (through increased production of cash crops) and poverty alleviation (through sale of agricultural Synthesis) and lack explicit nutrition-focused objectives<sup>18</sup>.

Many of the countries studied have taken steps to include nutrition within other ministries' policies, but they have yet to monitor the operational progress at a national, centralised level. Implementation of nutrition-sensitive agriculture also relies on a workforce educated in the relevant skills and understanding the competencies required to carry out a multi-sectoral plan.

Many of the policies and programmes analysed address pieces of the nutrition challenge, but the policymaking structure has been traditionally isolated within distinct ministries under the assumption that their goals are sector-specific. Nutrition is a complex, multi-sectoral challenge and current policy responses do not necessarily reflect those complexities.

Most of the agriculture policies analysed concentrate on increasing production of cash crops and economic growth. These priorities do not naturally coexist with those of nutrition-sensitive agriculture, such as increasing production of foods, improving food processing and storage to retain nutritional value, and targeting populations that are vulnerable to malnutrition.

The lack of expertise and coordination between ministries is another challenge to achieving a supportive environment in the countries, with perhaps the exception of Brazil and Thailand.

Effective nutrition-sensitive agriculture requires expertise not only in nutrition, but also in food systems, agricultural production, enterprise, community engagement, and health.

Many of the countries' key stakeholders recognized that there are few to no agricultural policy-makers or programme personnel who also have expertise in health and nutrition, nor do they include or appoint experts during policy development.

Each of the major food and agriculture policies had some issue with their monitoring and evaluation frameworks. Some of the issues are due to a lack of evidence that still

exists between agriculture, nutrition and health, so collection of objective data is key. It is also unclear how middle-income countries – including Brazil, South Africa and Thailand — will effectively address the dietary and nutrition transition that is increasing the overweight and obesity burden and risk of non-communicable disease. This remains a central unresolved issue for all countries. It is unclear how to mitigate the “globesity” trend of increasing overweight and obesity through the food and agriculture sector.

The objectives of nutrition, agriculture and health are intrinsically related and often mutually reinforcing. A clear understanding of those relationships among policymakers, achieved through improved education in nutrition-sensitive approaches and a mutual language for engagement, can break down many of the barriers to collaboration. The multi-sectoral nature of nutrition provides an opportunity to be innovative in policy approaches and incentives. For example, given the importance of proper nutrition on the economic productivity of the population, there is a strong economic justification for using fiscal, trade, and regulatory instruments to support the production and consumption of nutritious foods. A concerted effort should be made to ensure that nutrition is a defined priority and responsibility of the agriculture sector, and ultimately the health and education sectors as well.

Nutrition is often considered an institutional orphan that does not fit neatly into the defined scope of work of any one ministry. Finally, effective monitoring and evaluation systems are essential for policymakers to achieve substantive gains in nutrition-sensitive agriculture. Clear and defined metrics should be developed to guide operational programmes in agriculture and health toward common goals, and governments should measure and evaluate the contributions of agriculture and food to diet and health. Rigorous monitoring and evaluation systems will equip policymakers to be targeted and data driven in their response to nutrition challenges and facilitate a more productive dialogue among relevant stakeholders<sup>18, 19</sup>

It is clear that the policy priorities for agriculture should include explicit nutrition objectives. More analysis is needed specifically around<sup>18</sup>:

- The challenges of operationalizing nutrition-sensitive agriculture policies;
- Identifying metrics that effectively measure and evaluate the contributions of agriculture to diets and health, and provide feedback to policies and programmes;
- Assessing gaps in skills and required competencies, and making plans to close those gaps; and
- Understanding long-term implications of nutrition-sensitive agriculture in the context of the increasing global pressures of population growth, urbanisation, and climate variability.

#### **Food and agriculture policies can have a better impact on nutrition if they:**

- Increase incentives for availability, access, and consumption of diverse, nutritious and safe foods through environmentally sustainable production, trade and distribution.
- Monitor dietary consumption and access to safe, diverse, and nutritious foods. The data could include food price of diverse foods, and dietary consumption indicators for vulnerable groups.
- Include measure that protect and empower the poor

and women. Safety nets that allow people to access nutritious food during shocks and seasonal times when income is low; land tenure rights; equitable access to productive resources; market access for vulnerable producers. Recognizing that a majority of the poor are women, ensure equitable access to all of the above for women.

- Develop capacity in human resources and institutions to improve nutrition through the food and agriculture sector ,supported with adequate financing
- Support multi-sectoral strategies to improve nutrition within national, regional, and local government structures.

#### **Reviews of the Impacts of Agriculture on Nutrition**

The type of agriculture growth that takes place also matters a great deal for nutrition. Agriculture has succeeded in massively increasing the amount of staple grains produced, but the world still faces serious challenges related to nutrition, the lack of nutrition in the intake of food, breeds, malnutrition, undernourished, health risks to farmers and consumers, mortality to women and children. Hence, for leveraging agriculture for nutrition the only way to combat maladies .It could promote diversification of agriculture into nutritious and high value products viz., dairy, horticulture. There is fewer systematic review of agricultural project with explicit goals related to nutrition and health. The review often shows weak linkages in between agriculture-nutrition and health. This is because, by the time professionals in the 3 sectors after completing education, no longer speaks the same language and retain their respective field's expertise. To address the scandal of acute under nutrition inter cross disciplinary programs, is required to improve agricultural-nutrition linkages

#### **The Current State of Empirical Evidence**

Most of the reviews set out to answer, do agriculture interventions improve nutrition?

The range of interventions is wide; some focus on micro-nutrient outcomes<sup>19</sup>, some on diversification strategies<sup>20,21</sup> while others looked at range of productivity enhancing interventions<sup>22,23</sup>. However, whatever approach used, criteria adopted, types of activity considered, and analytical techniques used, these reviews came up with very similar conclusions.

Concluded reviews are as under:-

- Empirical evidence of positive net impacts on nutrition outcomes is scarce.
- When positive impacts have been documented, mechanisms are poorly articulated
- Positive impacts are more likely where integration of multiple sectors of activity was strong, yet understanding of the contributions of different elements remains weak.
- Impacts can be achieved via, multiple pathways, but analysis of the roles of different pathways is still lacking
- Women's combined rates in agriculture, dietary choices and health care matter a great deal to child nutritional status, but few agricultural interventions target all three domains
- The nutritional impacts of price/trade policies as mediated by agriculture and food choices at household level have been assumed rather than fully explored and measured
- The lack of empirical evidence of agricultural impacts on nutrition outcomes may say more about poor study

designs and method used than it does about the interventions considered. That is, a lack of evidence to date does not negate the possibility that evidence of positive impacts may still be found.

- The vast majority of published studies lack statistical power (sample size) to identify impacts even if they tried to, few incorporated rigorous counterfactual analysis, many outcome indicators selected were not appropriate for the kind of intervention or pathway considered, and few consider heterogeneity of impact even when those were positive.

This reflects partial, often imperfect, knowledge of links along the chain from agriculture to nutrition, regardless of pathway. On the one hand, researchers have paid too little attention to study design and methodological rigor and are therefore unable to demonstrate positive impacts even if those have been achieved. On the other hand, too few interventions have invested in appropriately measuring the human impact, let alone cost-effectiveness, which would allow for comparisons across possible alternative pathways<sup>24</sup>. Ruel (2001) stated that "enormous information gaps still exist concerning the efficacy and the effectiveness of most of the strategies reviewed." As a result, although there remains widespread faith in the potential for investments in agriculture to help improve nutrition and health, the evidence for this remains insubstantial.

#### Operating Levers for change

Policy makers, researchers, development agencies, NGO's and others have at their disposal a range of tools that may help to leverage agriculture for better nutrition and health including economic, social, governance, and inclusion and science and technology levers.

- *Economic levers*: This can change components of good nutrition, viz., Availability of healthy food, People's economic access to those foods and people's ability to absorb the nutrients in those foods.
- *Social Levers*: Bringing people together across sectors and community to jointly work toward improving nutrition and health
- *Governance and inclusion levers*: The government to make cash transfer to farmers' condition on improving the integrity of ecosystem and the health of crops. Farmers should invest in ecosystem services, and not to invest in infrastructure for healthy food system. Another is to use public food procurement a policy tool to available to all levels of government in all countries to push toward healthy agri- food systems.
- *Science and tech levers*: Researchers should collect and analyse more information on people's usual food consumption patterns and nutrients intake. Another, task to come up is field friendly and affordable methods to measure nutritional status.

#### Cross Cutting themes: Build Resilience to shocks, empower women and improve nutrition knowledge and practices

The importance of mediating environmental factors has only been highlighted as relevant to nutrition. This factor mediates between nutrition consumption and nutritional outcomes. It is clear that removing negative factors or promoting resilience in health and food environments may be necessary to enhance the investments made by poor households (increased income of households) in higher food consumption of nutrients. The use of resilience building as an advocacy tool to push a multisectoral nutrition agenda forward is important to justify the integrated ap-

proach that requires participation across sectors, as well as a variety of aid modalities to strengthen local food systems and improve local feeding practices<sup>25</sup>. When assessing the programming landscape following points should be well taken in order to design an effective pathway from agriculture to nutrition.

- Global price shocks
- Price effect on demand for high quality complementary foods in the context of dietary transition, time constraints to food preparations, seasonality of product availability
- Women's control of income from agriculture and non-agriculture sources is an important factor in nutrition outcomes of children.
- Policy and price links to nutritional status varies by nutrient, by the price and cross price elasticity of various foods.

By building the models which bring agri/nutrition/health sector closer together, generating the evidence base on the link between nutrition, health and productivity and by sharing the learning and best practices for replications and scaling up. It is possible to create the dramatic and sustainable impact on the lives of farming families.

#### Looking Ahead

The researcher face the task of collecting much more evidence on the links among Agriculture, nutrition and health and how they can be effectively exploited to human well-being. But it is not to be paralysed in the face of lack of evidence. More could be done to change the incentives embedded in agriculture policies to encourage farmers to produce more highly nutritious foods<sup>26,27,28</sup>.

#### Knowledge Gaps<sup>29</sup>:

- Learn more about how different patterns of agricultural growth affect nutrition and health
- Invest in research, evaluation and education systems capable of integrating information from all three sectors
- Fill the gap in governance knowledge at the global, national and community levels.

#### Do no harm:

- Mitigate the health risks posed by agriculture along the value chain
- Design health and nutrition interventions that contribute to the productivity of agricultural labour
- Look at the demonstration effects of subsidies for production or consumption on consumer nutrition and health
- Seek out and scale up innovative solutions.
- Scale up successful interventions
- Design Agricultural-nutrition-health programmes with cross sectoral benefits
- Incorporate nutrition into value chains for food products.
- Use all available levers for change
- Increase consumer nutrition-literacy knowledge and highlight the consequences of dietary choices
- Create thriving atmosphere /environment of cooperation
- Focus on partnerships among agriculture, nutrition and health.
- Develop mutual accountability mechanisms among three sectors
- Correct market failures
- Use communication and advocacy to bring about



change

Effort to exploit the synergies among agriculture, nutrition and health is still in its infancy. This effort offers real potential for improving lives and nutrition of people worldwide.

### Recommendation

A comprehensive goal must acknowledge and address various aspects of food security and nutrition, and include a select number of targets and indicators to measure quantifiable progress. Given the complexity of this challenge, it is important to establish clear principles to guide further discussion and the development of a goal<sup>30</sup>. Specifically, the targets and related indicators must consider the following points:

- Geared toward solving critical global issues, including hunger, poverty, malnutrition, environmental degradation, and gender inequality.
- Supportive of inclusive economic growth and empower women.
- Assess the nutrition context at local level. Understandable and resonate with the general population.
- Incorporate explicit nutrition objectives and indicators into design. Ambitious, but technically feasible and measurable. Incorporate nutrition behaviour change communication.
- Applicable to both developed and developing countries, small and large farms, enabling some level of cross-national comparison to evaluate relative progress, while still allowing for varying contexts.
- Applicable to a wide range of stakeholders – not only public agencies, but also civil society and private sector actors and farmers groups, which should be intimately involved in holding governments to account for tracking of targets and indicators. Target the nutritionally vulnerable group.
- The world needs nutrition accountability: Government and other stakeholders must be held accountable for the actions they say they will take to address public health problems. Collaborate and coordinate with other sectors.
- Realistic political ,policy , financing and capacity challenges to be addressed.
- A range of high impact, cost-effective nutrition intervention exists.
- Nutrition cannot be dealt with an isolation: rather it should be place at the heart of policies pursued in health and education trade and investment, social protection and agriculture.
- Advocacy with coherent strategies with regard to food security, poverty reduction, economic development and support for women and young people as key economic stakeholders.
- Expand markets and market access for vulnerable groups.
- Increase market access and opportunities for nutritious foods.
- Every country must highlight crucial connections between nutrition and climate –smart agriculture.Maintain or improve the natural resource base.
- Nutrition policy makers need their work to become more climate resilient to strengthen both production and consumption mitigation opportunities
- Focus on dietary diversity – to promote harmonization of nutrition related activities by the ministries of education and agriculture. Build homestead gardens to provide livelihood support for female – headed households with labour shortages. Facilitate production of

diverse, nutrient-dense foods and improve processing

### Conclusion

Food systems are changing and so the dialogue on policy actions that influence them is required. The traditional ways of looking at agricultural productivity as the solution to food security are no longer tenable. More food is needed, but so much more than that is necessary to ensure healthy food systems and healthy people.

The review as a whole revealed that the empirical evidence of positive net impacts on nutrition outcomes is scarce. Where positive impacts have been documented, mechanisms are poorly articulated. Positive impacts are more likely where integration of multiple sectors of activity was strong, yet understanding of the contribution of different elements remains weak. Impacts can be achieved via multiple pathways, but analysis of the roles of different pathways is still lacking. Women's combined roles in agriculture, dietary choices and healthcare matter a great deal to child nutritional status, but few agricultural interventions target all three domains. The nutrition impacts of price/trade policies as mediated by agriculture and food choices at household level have been assumed rather than fully explored and measured. The lack of empirical evidence of agricultural impacts on nutrition outcomes may say more about poor study design and methods used than it does about the interventions considered. That is, a lack of evidence to date does not negate the possibility that evidence of positive impacts may still be found. Guiding principles are important, governments need to generate such evidence and share best practices.

A number of cross-cutting issues underlie the effectiveness of potential pathways from agriculture to nutrition, and so were useful to keep in mind when assessing the programming landscape. As mentioned above, integrated nutrition sensitive agriculture projects whose interventions include gender considerations and nutrition education components work better than those which do not. This is because empowering women and improving nutrition knowledge and practices are essential to the sustained success of any nutrition program, regardless of sector or context. In contrast, building resilience is a concept which, historically, has been most often applied in emergency food security contexts. However it is now routinely considered in the design of nutrition-sensitive programmes as well, primarily as a framework within which to promote a variety of nutrition activities. In addition by indirectly strengthening communities and local economies, good nutrition contributes to the achievement of other development objectives which in turn impact upon the SDGs.

As far as agricultural policies are concerned there have been too few which aim deliberately at improving nutritional outcomes of women and children, and even fewer that have documented impacts on nutrition. To ensure that national agriculture and food policies support optimal nutrition outcomes, governments must look beyond the provision of incentives for the production of staple crops towards governance of a complex, market-driven system that, while rooted in local markets, must recognise the interests of the private sector and a variety of consumer preferences which are becoming increasingly urban-based. Policies that shape national food systems must also take into account the trade environment, the potential for development of an agribusiness industry to add value and employment locally, governance of the wholesale/retail segments of the value chain, and the overall affordability

of food to key groups of consumers, including the most nutritionally vulnerable.

It is clear from the examples of policies presented in the texts that agriculture and food policies can have not only positive but unintended negative nutritional consequences. For instance, farm policies that focus only on the supply of high-energy staple foods may lower the price of those foods relative to more expensive vegetables, pulses, fruit and animal based foods, making it more difficult for more people to achieve healthy diets. But even when nutritious foods are affordable, investments are often needed to support consumer education that promotes appropriate choices by the consumer. Reinforcing, removing or enacting new policies in a concerted fashion is essential to ensuring that all domains of the food system are adequately addressed rather than just one part or another.

It has also been concluded that there are Research Gaps also in the Agriculture-Nutrition Nexus. Research should focus on the full pathway of change from agricultural inputs, practices, value chains, food environment to nutrition outcomes and indirect effect of changes in agriculture on nutrition, through income and economic growth and associated changes in health and investments in health and education services. The effects of agricultural policy on nutrition as mediated through the value chain should be given importance. Governance, policy processes and political economy as it relates to the development of agriculture for nutrition policies and programmes, the ability to implement them (and scale up) and for them to achieve their stated goals once implemented. Needs to look on the way research on agriculture and nutrition is conducted, such as the development of methodologies and appropriate metrics. Approach consumers as a broader target group, notably rural workers and non-rural populations because the rural and urban poor at risk from nutrition related non-communicable diseases. Research planned should be Cost-effective. Research should emphasise to increase availability and affordability of nutritious, non-staple foods, and also to improve the productivity and nutritional quality of crops and livestock and its products. This can involve greater public as well as private research investment, and better

extension services and farmer support, as well as improved infrastructure for storage and distribution of these more perishable products, and price incentives that stimulate their production. The focus of past decades on raising productivity of a few staples was not inherently misplaced, but it must now be nuanced. The Global Panel aims to offer effective guidance to decision makers, particularly governments, on how best to move towards nutrition enhancing agricultural and food policies and investments.

It is urgent that new and updated policy actions address the needs of nutritionally vulnerable people by making high quality diets the norm and not a luxury. The world of food and agriculture is changing rapidly. Our collective commitment to the right kinds of actions must keep pace with this change if global food systems are to make a meaningful contribution to sustainable human development. The challenges of improving agricultural –nutrition linkages to address the scandal of acute under nutrition are therefore very substantial. There is much to play in addition by indirectly strengthening communities and local economies; good nutrition contributes to the achievement of other development objectives which in turn impact upon the SDGs.

Overall the international community needs to collectively endeavour to understand the resulting impact on nutrition outcomes. Policies need a longer-term horizon that internalises these shifts, as well as the monitoring systems and metrics to interpret the long-term effects and changes. Supportive policy environment, well-developed human resource with effective system to plan, implement and monitor for creating successful, nutrition-sensitive agriculture policies and program. We need to be SMART- that is specific (target a specific area for improvement), measurable (Quantify or at least suggest an indicator of progress), assignable (Specify who will do it), realistic (state what results are realistically be achieved given available resources) and time- bound (Specify when the results can be achieved)<sup>31</sup>.

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