ICIMOD Working Paper 2016/7

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FOR MOUNTAINS AND PEOPLE

Towards an Integrated Approach to Nutrition Security in the Hindu Kush Himalayan Region

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The International Centre for Integrated Mountain Development (ICIMOD) is a regional knowledge development and learning centre serving the eight regional member countries of the Hindu Kush Himalayas (HKH) – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – based in Kathmandu, Nepal. Globalization and climate change are having an increasing influence on the stability of fragile mountain ecosystems and the livelihoods of mountain people. ICIMOD aims to assist mountain people to understand these changes, adapt to them, and make the most of new opportunities, while addressing upstream and downstream issues. ICIMOD supports regional transboundary programmes through partnerships with regional partner institutions, facilitates the exchange of experiences, and serves as a regional knowledge hub. It strengthens networking among regional and global centres of excellence. Overall, ICIMOD is working to develop economically- and environmentally-sound mountain ecosystems to improve the living standards of mountain populations and to sustain vital ecosystem services for the billions of people living downstream – now and in the future.

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Towards an Integrated Approach to Nutrition Security in the Hindu Kush Himalayan Region

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Executive Summary

Malnutrition remains a serious challenge in the Hindu Kush Himalayan (HKH) region and still affects a large proportion of the population. The challenges and issues of nutrition security in mountain areas are different to those in the plains, and need special attention from governments. We examine the status of nutrition security in the mountain areas of the HKH countries and identify the key issues and challenges, and the potential role of Himalayan traditional crops in addressing these challenges. Based on our findings, we suggest an integrated approach towards achieving nutrition security in the mountain areas of the HKH region.

The study found that the prevalence of stunting, wasting, and underweight in children under five in some mountain areas such as Meghalaya in India, the western mountains and far-western hills of Nepal, Balochistan province in Pakistan, the eastern region of Afghanistan, and Chin state in Myanmar, is very high compared to the national average in the respective countries. Children and women are affected most. Poor nutrition leaves children underweight, weakened, and susceptible to infection, and ultimately stunted and deprived of cognitive and learning capacity. Any intervention should have a special focus on the first 1,000 days of a child's life, at the peak of their vulnerability. Women play a significant role in the nutritional outcome of their children and other household members and should be empowered to make favourable decisions that help improve the nutritional status of the family.

There are several causes of undernutrition and malnutrition in the HKH region and an integrated approach is needed to tackle the issues. Malnutrition is a multidimensional problem that demands a multisectoral approach, but nutrition interventions often work in isolation and fail to include the agricultural, social, cultural, economic, and public health dimensions. Policies should recognize that nutrition issues are cross-cutting; nutrition needs to be integrated into all development processes and targeted nutrition programmes should be combined with poverty alleviation programmes. The study proposes an integrated framework to improve nutrition in the HKH region effectively. The key elements are as follows; it is hoped that they will stimulate discussion on future action:

Key Elements of the Proposed Integrated Framework for Improving Nutritional Status

Create an enabling policy environment

- Mainstream nutrition aspects across sectors: increase policy coherence by integrating nutrition security into development policies and programmes and aligning these with nutrition goals. Prioritize nutritionally high-risk areas, communities, households, and individuals such as children, pregnant women, lactating mothers.
- Consider introducing regulations to minimize the promotion of less-healthy foods and beverages, particularly sugar-sweetened high calorie beverages and nutrient-poor fast foods.

Leverage agriculture for nutrition and health

- Incorporate nutritional aspects into agricultural policies and programmes.
- Intensify research on the biofortification of staple foods for the poor and on product diversification through processing and value addition.
- Incorporate explicit nutritional objectives and indicators into agricultural investments.
- Promote crop diversity and conservation of agrobiodiversity, especially of nutrition-rich traditional crops, and rejuvenate local food production systems.
- Foster the adoption of biofortified local crop varieties by smallholders

Create economic opportunities for small scale farmers and the rural poor

- Foster income generation for small-scale farmers by expanding financial and technical assistance and improving the infrastructure and institutional setting for processing and marketing of agricultural produce and value-added products.
- Increase economic efficiency by reducing food loss during processing, storage, and distribution of agricultural produce. Improve legislation around retail systems to reduce wastage at the retail and consumption levels.

  Increase rural non-farm economic opportunities by creating and strengthening institutional mechanism to create job opportunities in foods processing, manufacturing and the service industry, with special consideration of youth.

Empower women, create and spread knowledge and awareness

- Empower women by improving their knowledge, control of resources, and bargaining power within the household to enable them to make good decisions on matters related to family health, education, and food.
- Create awareness programmes on breastfeeding and child-care practices for (pregnant and lactating) women.
- Provide nutrition sensitive social protection systems and scale them up. Provide micronutrient supplements for children and mothers when necessary.
- Include nutrition education in primary and secondary school curriculums.

Improve access to water, sanitation, and health facilities

- Provide access to adequate water and sanitation facilities.
- Improve access to and use of safe health services, and ensure a safe and hygienic environment.

Shan Hills, Myanmar

Introduction

Food and nutrition security are basic human needs and essential for living a healthy and productive life. Although the Hindu Kush Himalayan (HKH) region has made progress in increasing the per capita calorie intake in recent years, nutrition security remains an unfinished agenda and malnutrition and hunger are still widespread. Malnutrition is a broad term that refers to undernutrition, overnutrition, and deficient nutrition: individuals are malnourished if their diet does not provide them with adequate calories, protein, and essential nutrients for maintenance and growth, or they cannot fully use the food they eat, or consume too many calories. In the HKH region, the concern is with lack of calories and nutrients. Of the 795 million people undernourished globally, 52% (415 million) are in the HKH countries (SOFI 2015). Micronutrient deficiencies (zinc, vitamin A, iodine, iron) are affecting the survival, growth, health, cognitive development, productivity, and wellbeing of future generations; while malnutrition is responsible for poor health, low socioeconomic development and high child mortality.

The nutritional challenges have mountain specificities and result from a range of socioeconomic, environmental, and cultural factors. Hill and mountain terrain imposes an additional burden on people's health and nutrition and aggravates the problem of undernutrition. Dutta and Pant (2003) found that 30% of the population in the Garhwal Himalayas in Uttaranchal, India were suffering from undernutrition. A study conducted in Nepal revealed that the magnitude of undernutrition was high in the mountain areas (GoN 2013); while in Pakistan, the prevalence of stunting, wasting, and micronutrient malnutrition was also found to be higher in the mountain provinces (NNS-GoP 2011), with the poorest groups suffering from alarming rates of undernutrition. People in remote mountain areas periodically face shortages of food and don't consume enough to meet their minimum energy and nutrient needs, restricting their ability to enjoy a normal healthy life. Infants with low birth weight caused by maternal malnutrition, are at greater risk of illness and death, impaired cognitive development, and (for females) poor pregnancy outcomes later in life. Stunted baby girls grow into small mothers who in their turn deliver underweight babies. Children suffering from malnutrition do not grow well and have more learning difficulties. Their immune systems are affected, making them less resistant to infection. In adulthood, the accumulated effects of malnutrition can reduce labour productivity, which in turn limits the earning potential of households and communities. While at the individual level, severe malnutrition is clearly life-threatening, at community level, malnutrition results in reduced overall economic productivity (Jenny and Egal 2002).

Micronutrient deficiencies are pervasive in the HKH region (Kuhnlein and Pelto 1997). Deficiency of micronutrients may not only lead to stunting, wasting, and underweight, but also to several other medical malfunctions (NNS-GoP 2011). In mountain areas, nutritional deficiency disorders, such as protein-energy malnutrition and deficiencies of micronutrients such as iodine, iron, and vitamin A, are the result of numerous factors, including insufficient or inadequate intake of food caused by poverty and/or inappropriate feeding practices. Infections and parasitic disease, which are linked to poor environmental sanitation and poor health and care practices and services, also contribute to micronutrient deficiencies (Ellis and Mason 1999).

In terms of agricultural production, mountain areas have a low carrying capacity and often inefficient utilization of natural resources. They are physically isolated due to steep slopes and harsh conditions, the construction and maintenance of infrastructure is difficult and expensive, and the transport costs for food and non-food items to mountain areas are high. Lack of fuel can also affect the supply of food items and agricultural inputs, resulting in shortages and raised prices. The poor accessibility of mountain areas also reduces access to social services, which has a negative effect on standards of health and education and leads to the separation of mountain people from mainstream economies. Mountain communities have a greater dependence on the natural resource base, which has clear implications for the ecological balance.

Lack of understanding of mountain communities by government institutions has led to inappropriate decision making and under-valuing of indigenous knowledge, experience, and economic systems. As a result, mountain people often have to adapt their livelihoods to policies, laws, and interventions that compromise their access to food and productive resources, undermine their knowledge systems and social organization, and marginalize them further (Jenny and Egal 2002; Jodha 1990).

Malnutrition is a vicious cycle and can be transferred from generation to generation. A well-nourished, healthy workforce is a precondition for successful economic and social development. Nutrition is both an input to and an output of the development process. The impacts of malnutrition are higher among the poor, women, and children, leading to negative effects on immune functioning, cognitive development, child growth, reproductive performance, and work productivity (Underwood 2000). Undernutrition and poor health has many social implications, in particular poor nutrition of children has long-lasting consequences and can seriously impede national development. Stunting and poor cognitive development share many risk factors: not only does malnutrition put a child at risk of infection, but infections also contribute to the symptoms of malnutrition.

Nutrition is an essential input to social and economic development and an invaluable cross-cutting investment. In other words, achieving nutrition security is a building block that can help developing countries meet development goals related to health, education, gender equality, and poverty alleviation. For example, investment in girls' nutrition can help advance the status of women and increase gender equality. Attention to nutrition concerns can make agriculture more profitable by connecting it to the needs of consumers; it can also make environmental practices more sustainable by bringing them in line with traditional dietary patterns. Likewise, improved nutrition is an important first step in developing human capital and reducing poverty. Moreover, good nutrition can mitigate the conditions for conflict, while better nutritional status improves immunological integrity and helps prevent development of non-communicable diseases such as diabetes (Macdonald et al. 2002).

Food and nutrition security is fundamental to socioeconomic development; nutritional status is accepted as an indicator of national development. Undernutrition and poor health perpetuate poverty from generation to generation. Hence, food and nutrition security is a central issue on both national and global agendas. Several national and international initiatives have been undertaken to tackle the problems of food insecurity. The UN Secretary General's Zero Hunger Challenge calls for progress and unified action towards realizing the aim of food and nutrition for all. The post 2015 framework should build on and further develop such initiatives. . Four of the United Nations Sustainable Development Goals (SDGs) are closely related to nutrition security: Goal 2 – End hunger, achieve food security and improved nutrition and promote sustainable agriculture; Goal 3 – Ensure healthy lives and promote well-being for all at all ages; Goal 6 – Ensure access to water and sanitation for all; and Goal 12 – Ensure sustainable production and consumption patterns. Addressing malnutrition effectively is also fundamental to meeting many other SDG targets.

The nature and causes of undernutrition and malnutrition in mountain areas are often different from those in the plains due to the difficult topography, poor accessibility, poor market access, and inadequate public health systems. It is important to assess the status of undernutrition and malnutrition and identify causes and pathways to achieve nutritional security specifically for mountain areas. So far, there has been no systematic study of nutrition issues in mountain communities across the HKH region. This paper aims to assess the nutritional status and underlying causes of malnutrition of the mountain people in the HKH, and identify options and strategies to improve nutritional status. The findings of the study are expected to be useful to government and non-government agencies in designing policies and programmes to improve nutrition security. The paper is divided into six sections: this first section presents the context and is followed by sections on the status of nutrition in the mountain areas of the HKH, the key issues and challenges in achieving nutrition security, the potential of traditional crops, a discussion of the findings, and the outline of a framework for integrating nutrition into the development process and suggestions for policy.

Nutrition Status in the HKH

The status of nutrition in the HKH region is extremely poor. A large proportion of the population suffers from food insecurity and hunger (Table 1). In Pakistan, close to 67% of the population is food insecure in the mountain areas compared to 40% in the plains; while mountain areas have a food deficiency of almost 50%, compared to a food surplus of about 18% in the plains. In Nepal, close to 60% of people in the mountains and 53% in the hills are food insecure, compared to 48% in the plains. In India, rural mountain people consume 2,098 kcal/day per capita, less than the national average of 2,147 kcal/day; and protein intake is also less than the national average. Taken together, the statistics paint a clear picture of high food insecurity in the mountain areas of the HKH region.

Millets field in Gatlang VDC, Rasuwa district of Nepal

Table 1: **Food (in)security in the Hindu Kush Himalayan region**

Country	Indicator		Mountains	Plains	National average	Notes
Afghanistan[a]	Households not meeting their caloric needs		-	-	35%	
	Households having very poor dietary diversity		-	-	46%	
Bhutan[a]	Population below national poverty line		-	-	12%	National poverty line Nu.1704 / person/month in 2012
India	Dietary energy intake (kcal/day/capita)	Rural	2098	-	2,147	Mountain statistics estimated for states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Sikkim, and Tripura
		Urban	2092	-	2,123	
	Protein intake (g/day/capita)	Rural	56.4	-	59.3	
		Urban	57.1	-	58.8	
Nepal	Proportion of food secure population		mountains 40.5% hills 47.2%	52.1%	49.2%	-
Myanmar	Incidence of food poverty		25% (Chin state)	-	4.8%	-
Pakistan	Proportion of food insecure population		67.4%	40.2%	48.6%	All districts of Pakistan taken into account
	Food deficit/surplus		-50%	+18%	+9%	+ = surplus - = deficit

[a] Whole country classed as mountains/hills

Source: Giribabu (2013); MOHP Nepal (2012); FSA (2009); Hussain (2010); IHLCA, 2010 (Myanmar); GoB, 2014; GoA, 2009

Prevalence of Underweight, Stunting and Wasting in Children Under 5

Another clear indicator of problems with nutrition security in the HKH is the high prevalence of stunting, wasting, and underweight in children under the age of five (Table 2).

Details for the individual countries are provided in the following paragraphs. In Afghanistan, almost all of the geographical area is either mountainous or hilly. It isn't possible to separate the statistics for mountain and non-mountain areas, but differences can be seen within the mountain areas. The prevalence of stunting is very high in the north eastern, north western, and eastern mountain regions, ranging from 45% to 53%, with particularly high values of stunting (53%), wasting (18%), and underweight (41%) in the eastern mountain region (Table 3).

The prevalence of stunting, wasting, and underweight in children in the mountain states of India is slightly lower than in the plains areas but still very high at close to 43%, 16%, and 35%, respectively, with marked differences between states (Table 4). Among the mountain states, the level of prevalence of underweight, stunting, and wasting is highest in Meghalaya. The prevalence of stunting (<40%) is also very high in Uttaranchal, Arunachal Pradesh, and Assam (Table 4). The prevalence of wasting is higher in Himachal Pradesh, Uttaranchal, and Tripura than in other mountain states, affecting almost a quarter of the children under five in Tripura. In Meghalaya, almost half of the children under five are underweight. The percentage of underweight children in some other states such as Himachal Pradesh, Uttaranchal, Arunachal Pradesh, Assam and Tripura is also very high, ranging from 32% to 40% (Table 4).

Table 2: **Prevalence of stunting, wasting, and underweight in children under 5 in the HKH countries**

Country	Stunting[a] (%)	Wasting[b] (%)	Underweight[c] (%)
Afghanistan	40.9	9.5	25.0
Bhutan	33.5	5.9	12.7
India	48.0	19.8	42.5
Myanmar	28.6	7.7	28.8
Nepal	40.5	10.9	28.8
Pakistan	44.4	10.7	29.4

[a] Height-for-age: children under 5 < -2 SD from the international reference median value
[b] Weight-for-height: children under 5 < -2 SD from the international reference median value
[c] Weight-for-age: children under 5 < -2 SD from the international reference median value

Source: NFHS 2006 (India); AMS 2010 (Afghanistan); NDHS 2011 (Nepal); DHS 2012-13 (Pakistan); MICS (Myanmar), 2011; WHO-UNICEF 2015

Table 3: **Prevalence of stunting, wasting and underweight in children < age 5 years in Afghanistan**

		Stunting[a] (%)	Wasting[b] (%)	Underweight[c] (%)
Afghanistan overall		40.9	9.5	25.0
Mountain region	Northeast	44.6	8.5	27.8
	Northwest	45.7	5.9	22.6
	East	52.6	18.0	41.3
	Central	37.4	8.4	24.1
	West	31.0	5.6	16.7
	Southeast	35.0	7.9	27.6
	Southwest	39.9	10.1	23.6

[a] Height-for-age: children under 5 < -2 SD from the international reference median value
[b] Weight-for-height: children under 5 < -2 SD from the international reference median value
[c] Weight-for-age: children under 5 < -2 SD from the international reference median value

Source: AMS 2010

Table 4: **Prevalence of stunting, wasting, and underweight in children under 5 in India**

State	Stunting[a] (%)	Wasting[b] (%)	Underweight[c] (%)
India overall	48.0	19.8	42.5
Plains states	48.4	20.1	43.0
Mountain states	42.8	16.0	34.5
Individual mountain states			
Himachal Pradesh	38.6	19.3	36.5
Jammu & Kashmir	35.0	14.8	25.6
Uttaranchal	44.4	18.8	38.0
Arunachal Pradesh	43.3	15.3	32.5
Assam	46.5	13.7	36.4
Manipur	35.6	9.0	22.1
Meghalaya	55.1	30.7	48.8
Mizoram	39.8	9.0	19.9
Nagaland	38.8	13.3	25.2
Sikkim	38.3	9.7	19.7
Tripura	35.7	24.6	39.6

[a] Height-for-age: children under 5 < -2 SD from the international reference median value
[b] Weight-for-height: children under 5 < -2 SD from the international reference median value
[c] Weight-for-age: children under 5 < -2 SD from the international reference median value

Source: NFHS 2006

In Myanmar, the prevalence of stunting and wasting is higher than the country average in all the mountain states except Kachin; while the percentage of underweight children is high in Chin and Shan states (Table 5).

Table 5: **Prevalence of stunting, wasting and underweight in children under 5 in Myanmar**

Country/region		Stunting[a] (%)	Wasting[b] (%)	Underweight[c] (%)
Myanmar		28.6	7.7	28.8
Mountain states	Kachin	28.4	3.8	17.9
	Chin	51.8	8.2	35.8
	Rakhine	36.1	8.2	12.8
	Shan	42.9	10.3	41.6

[a] Height-for-age: children under 5 < -2 SD from the international reference median value
[b] Weight-for-height: children under 5 < -2 SD from the international reference median value
[c] Weight-for-age: children under 5 < -2 SD from the international reference median value

Source: MICS 2010 (Myanmar); GoB 2012

Pithoragarh, India

In Nepal, the prevalence of underweight and stunting is significantly higher in mountain areas than in the hills and plains. The proportion of stunted children in the eastern, central, and western mountain regions ranges from 45 to nearly 60% (Table 6). The prevalence of wasting and underweight is higher in the western mountains and mid and far-western hills than in other sub-regions (Table 6).

In Pakistan, the percentage of stunted and wasted children is slightly higher in the mountain areas than in the plains, with a particularly high prevalence of stunting (82%), wasting (13%), and underweight (37%) in the mountain province of Balochistan (Table 7). The mountains/plains differences are less marked than elsewhere as the indicators for the whole country are poor. In the mountain provinces of China such as Sichuan, Yunnan and Gansu, the situation of food and nutrition security is relatively better compared to the mountain areas of other HKH countries (FAO 1999a; Hussain et al. 2016).

Table 6: **Prevalence of stunting, wasting and underweight in children under 5 in Nepal**

Country/region		Stunting[a] (%)	Wasting[b] (%)	Underweight[c] (%)
Nepal overall		40.5	10.9	28.8
Ecological zones	Mountains	52.9	10.9	35.9
	Hills	42.1	10.6	26.6
	Terai (plains)	37.4	11.2	29.5
Sub-regions	Eastern mountains	45.0	8.4	23.5
	Central mountains	45.5	7.9	34.7
	Western mountains	59.5	13.2	42.0
	Eastern hills	45.5	10.5	28.6
	Central hills	31.3	15.0	22.5
	Western hills	36.0	7.6	16.8
	Mid-western hills	51.7	8.0	37.1
	Far-western hills	57.5	13.7	39.7

[a] Height-for-age: children under 5 < -2 SD from the international reference median value
[b] Weight-for-height: children under 5 < -2 SD from the international reference median value
[c] Weight-for-age: children under 5 < -2 SD from the international reference median value
Source: NDHS 2011

Table 7: **Prevalence of stunting, wasting, and underweight in children under 5 in Pakistan**

Country/region		Stunting[a] (%)	Wasting[b] (%)	Underweight[c] (%)
Pakistan		44.4	10.7	29.4
Non-mountain regions		43.9	10.5	29.8
Mountain regions		47.7	11.7	26.7
Mountain administrative units	Balochistan	81.9	13.2	37.4
	Gilgit-Baltistan	36.1	8.2	12.8
	Khyber Pakhtunkhwa	41.3	11.7	25.3

[a] Height-for-age: children under 5 < -2 SD from the international reference median value
[b] Weight-for-height: children under 5 < -2 SD from the international reference median value
[c] Weight-for-age: children under 5 < -2 SD from the international reference median value
Source: DHS 2013

Prevalence of Underweight and Body Mass Index in Women aged 15–49

The percentage of underweight women aged 15–49 is relatively high in the HKH countries, with rates of 9, 30, 18, and 14%, in Afghanistan, India, Nepal, and Pakistan, respectively. Although the overall percentage of underweight women is fairly low in Afghanistan, the rates are higher in the northeastern, northwestern and western regions. The

overall percentage of underweight women is very high in mountain states in India, (30%) (Table 8). The average body mass index (BMI) is similar in both mountain and plains states and falls within the normal range. In Nepal, the percentage of underweight women is higher in the mountains than in the hills (17% cf 12%), with the proportion highest in the western mountains, and mid- and far-western hills. In contrast, in Pakistan, the percentage of underweight women is low, and significantly lower in the mountains than in the plains 7% cf 16% (Table 8). The BMI statistics indicate that on average women in Khyber Pakhtunkhwa are slightly overweight.

Table 8: **Prevalence of underweight women aged 15–49 and body mass index (BMI)**

Country				
Afghanistan		Mountain area	Underweight[a] (%)	BMI[b]
	Mountain region	Northeast	13.7	nd
		Northwest	14.8	nd
		East	6.2	nd
		Central	7.9	nd
		West	10.9	nd
		Southeast	4.4	nd
		Southwest	9.1	nd
India	Mountain states	-	30.3	20.6
	Individual mountain states	Himachal Pradesh	29.9	20.8
		Jammu & Kashmir	24.6	21.4
		Uttaranchal	30.0	20.8
		Arunachal Pradesh	16.4	21.1
		Assam	36.5	20.0
		Manipur	14.8	21.5
		Meghalaya	14.6	21.0
		Mizoram	14.4	21.2
		Nagaland	17.4	20.8
		Sikkim	11.2	22.1
		Tripura	36.9	19.9
Nepal	Overall	-	18.2	21.4
	Mountains	-	16.5	21.0
	Hills	-	12.4	21.8
	Terai (plains)	-	22.7	21.2
	Mountain sub-regions	Eastern mountains	10.0	21.8
		Central mountains	14.9	21.2
		Western mountains	22.2	20.3
		Eastern hills	11.8	21.5
		Central hills	11.5	22.7
		Western hills	8.3	21.9
		Mid-western hills	18.6	20.8
		Far-western hills	23.4	19.8
Pakistan	Overall	-	13.9	24.5
	Non-mountain regions	-	15.5	24.3
	Mountain regions	-	6.8	25.7
	Mountain administrative units	Balochistan	9.0	24.0
		Gilgit-Baltistan	5.4	22.5
		Khyber Pakhtunkhwa	6.3	25.9

nd = no data

[a] Weight-for-age: women aged15-49 year < -2 SD from the international reference median value

[b] BMI categories: underweight = <18.5; normal weight = 18.5–24.9; overweight = 25-29.9; obese = >30

Source: NFHS 2006 (India);AMS 2010 (Afghanistan); NDHS 2011 (Nepal); DHS 2012-13 (Pakistan)

A women preparing traditional food dishes in Assam, India

Issues and Challenges in Achieving Nutrition Security in the HKH Region

Nutritional status is mainly determined by four underlying dimensions: access to safe and nutritious food, access to safe drinking water, adequate sanitation and health services, and maternal and child healthcare practices (UNICEF 1998). The causes of undernutrition and malnutrition are several and complex, as they encompass economic, social, biological and public health issues. The key issues and challenges in improving nutrition security in the HKH region are outlined in the following.

High Poverty and Low Energy Intake

Poverty is one of the major causes of maternal and child malnutrition as financial resources are needed to buy adequate nutritious food and access to sanitation, hygiene and health services. High poverty and vulnerability in the HKH region is a fundamental challenge in achieving food and nutrition security for all. Household choice and consumption of food is largely determined by household income and price of products (Drewnowski et al. 2004; Lo et al. 2012). Generally, low income groups prefer to buy low-priced, high energy food, regardless of the nutritional value (Monsivais and Drewnowski 2007; Kettings et al. 2009). Poverty rates are generally higher in the mountain areas of the HKH than in the plains and people have a very limited choice of food items due to their low income levels (Khan et al. 2015; Saboor et al. 2015; Table 9). In a case study conducted in Kailali district in Nepal, more than 60% of mothers reported being unable to feed their child nutritious foods such as eggs and meat because they could not afford them (Osei et al. 2010). Poverty impacts on all aspects of nutrition – food insecurity, inadequate access to safe drinking water, poor hygiene, poor housing and health services, and poor knowledge – trapping families in poverty from one generation to the next (CPRC 2004).

Table 9: **Incidence of poverty in the HKH region**

Country	Population below the poverty line in 2009			
	Million people		%	
	Overall	Mountain regions	Overall	Mountain regions
Afghanistan[a]	8	6.3	33	42
Bhutan[b]	0.7	0.7	23	23
India	415	24	36	34
Nepal	9	4.7	31	40
Myanmar	15.9	nd	32	nd
Pakistan	42.4	12.5	25	32

nd = no data

[a] Almost whole geographical area of Afghanistan is hilly or mountainous. The cited study placed some areas with fewer and low hills in the plains category.

[b] Whole geographical area of Bhutan is counted as mountainous

Source: Hunzai et al. 2011

Drinking Water, Sanitation and Hygiene

Nutritional status is strongly influenced by access to an adequate quantity and quality water and good sanitation environment. Water and sanitation are critical for health. Despite many efforts, access to safe drinking water and sanitation remains limited in the HKH region (Table 10). Except for Bhutan, a significant portion of the population in the HKH countries depends on unimproved and unsafe water sources. The situation is most serious in Afghanistan, and Myanmar, where 45% and 19% of the population, respectively, still use unsafe water.

Similarly, a significant proportion of the population in the region is deprived of improved sanitation facilities, with the situation most serious in Afghanistan where less than half the population has access to some form of improved sanitation. A significant proportion of the mountain population still practises open defecation: 32% in India and Nepal, 23% in Pakistan, and13% in Afghanistan.

Water and sanitation are linked to human health and nutrition. Inadequate access to safe drinking water and poor hygiene have been associated with increased incidence of waterborne and infectious diseases and malnutrition in children, women, and adults across the HKH region. Poor people suffer most, as they have the least capacity to invest in water and sanitation.

Table 10: **Access to safe drinking water and sanitation**

Country	Source of drinking water (%)				Sanitation facilities (%)			
	Improved		Unimproved		Improved	Shared	Unimproved	Open defecation
	Piped onto premises	Other	Surface water	Other				
Afghanistan[a]	12	43	6	39	32	12	43	13
Bhutan[a]	58	42	0	0	50	28	20	2
India – mountain states[b]	-	87	-	13	43	2	23	32
Myanmar[a]	8	73	5	14	80	12	4	4
Nepal[a]	24	68	2	6	46	18	4	32
Pakistan – mountain administrative units[c]	37	48	10	5	61	8	7	23

Note: No mountain specific data for Myanmar available; national level data used as a proxy

Source: [a] WHO-UNICEF 2015; [b] Census India 2011; [c] MICS 2011

Chittagong, Bangladesh

Nutrition Knowledge of Women and Education

Women play an important role in child nutrition and ensuring family health. In addition to having adequate access to a diverse array of foods, a mother's knowledge on nutrition, breast feeding, and caring practices, as well as access to health services and ability to ensure a healthy environment (hygiene and sanitation), are also important in achieving nutrition security. Evidence from the Nepal Himalayas (Osei et al. 2010) shows that mothers with no education are less likely to be able to provide their children with a minimum acceptable diet than mothers with some formal education. Women need knowledge about nutrition as well as skills; their knowledge of nutrition and hygiene is key in preventing child undernutrition. In the HKH region, there is a strong association between the level of mothers' education and child nutrition: the higher the education level, the lower the rate of child stunting, wasting, and underweight (Table 11). Inadequate knowledge of nutrition is an important factor in the high undernutrition rates in the HKH region.

Koshi zone, Nepal

Table 11: **Malnutrition of children by educational background of mother**

Country	Year	Mother's education	Percentage of children under five			Female literacy rate (age 15 and over)[a] (%)
			Stunting	Wasting	Underweight	
India	2005/06	No education	57	23	52	51
		<5 years complete	50	21	46	
		5–7 years complete	46	19	39	
		8–9 years complete	41	18	35	
		10–11 years complete	33	14	27	
		>12 years complete	22	13	18	
Nepal	2011	No education	48	13	38	49
		Primary	41	11	26	
		Some secondary	32	6	19	
		School leaving certificate and above	26	10	13	
Pakistan	2012/13	No education	55	14	39	43
		Primary	46	9	28	
		Middle	31	8	18	
		Secondary	21	7	14	
		Higher	21	6	10	

Description of stunting, wasting and underweight is same as under Tables 2-7

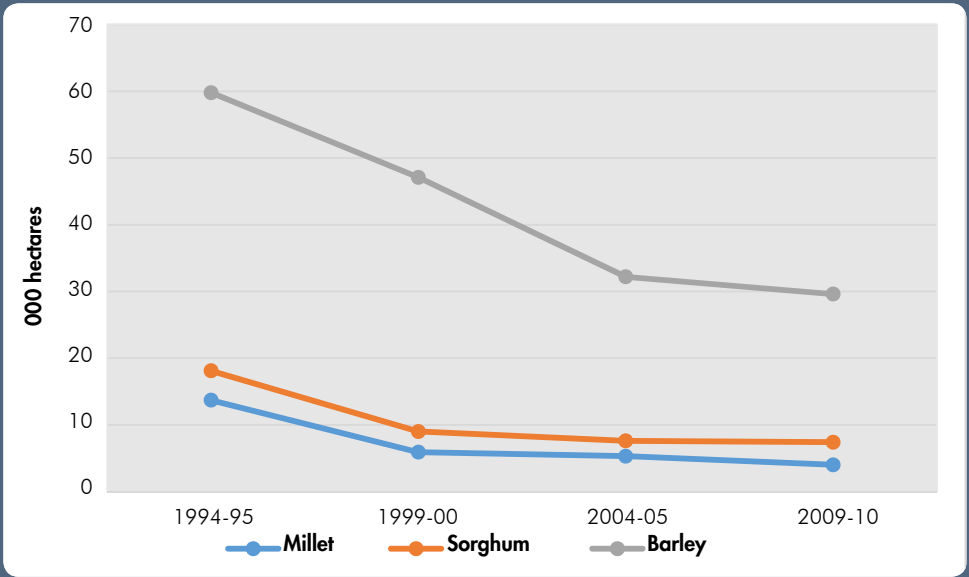
Source: NFHS 2006 (India); NDHS 2011 (Nepal), DHS 2013 (Pakistan); [a] UNESCO (2015)

Change in Crop Varieties and Agricultural Practices, Agricultural Land-use Change, Declining Agricultural Production Diversity

The rapid socioeconomic changes in the HKH are also influencing changes in agricultural practices, cropping systems, choice of crop varieties, and land use, as well as consumption patterns. Nutritious crops like amaranth; barley; buckwheat; finger, foxtail, minor, and proso millet; sorghum; and sweet potatoes were traditionally grown in the hills and mountains and played a key role in mountain agriculture and food and nutrition security, but production is dropping rapidly. High yielding varieties (HYVs) of rice and wheat have replaced crops such as sorghum, buckwheat, millet, barley, and oats. The traditional crops are gradually disappearing due to a number of factors including lack of awareness about their nutritional value among farming communities, lack of local market prospects for the produce, and increasing demand for crops such as rice, wheat, and maize. In Khyber Pakhtunkhwa province in Pakistan, barley, sorghum, and millet used to be grown extensively, but the area under these crops has halved in recent years (Figure 1). Similarly, in India, the production of sorghum decreased by 43% (from 11.4 million tonnes to 6.4 million tonnes) between 2009 and 2013 (FAOSTAT 2013). In most of the mountainous states in India, particularly Jammu and Kashmir, Himachal Pradesh, Sikkim, and Tripura, the area under pulses (excluding gram and tur) decreased substantially in 2011/12 compared to 1990/91 (GoI 2013). Pulses are often called the protein of the poor, but the decline in pulse production has increased the price so that many poor people cannot afford to buy adequate amounts. The decline in production of these rich protein sources may have long-term impacts on local dietary diversity and eventually nutrition security.

Various nutritional studies suggest that the nutritional value of millet, sorghum, and buckwheat is higher than that of white rice (e.g, Gopalan et al. 1989). Millet is unique among the cereals because of its richness in calcium, dietary fibre, polyphenols, and protein (Devi et al. 2011). It also contains significant amounts of essential amino acids, particularly the sulphur containing amino acids (methionine and cysteine), and is higher in fat content than maize, rice, or sorghum (Obilana and Manyasa 2002). Some studies have reported that millet is a good source of natural oil rich in linoleic acid and tocopherols (Liang et al. 2010; Amadou et al. 2011). The calcium and potassium contain in finger millet is exceptionally high compared to all other cereals (Gopalan et al. 2009) and total dietary fibre is higher than that of wheat, rice, maize, and sorghum (Shobana and Malleshi 2007; Siwela et al. 2010). Sorghum contains high levels of micronutrients like iron (more than 70 ppm) and zinc (more than 50 ppm), which are essential for reducing anaemia and stunting (ICRISAT 2011) and can help in reducing micronutrient deficiency. Replacing these traditional crops with rice and wheat and changing consumption patterns has significant implications for nutrition.

Figure 1: **Decline in area under cultivation of underutilized crops in KPK, Pakistan**



Source: ASP 2012

Changing Diets

The world is increasingly interconnected and diets are changing. Food habits and diet in the HKH region have been undergoing changes in recent years as a result of socioeconomic development, with access to roads, schools, and markets increasing, as well as access to radio television, and other information (Iyer 2012). Dietary changes are mainly seen in food grains, snacks, and drinks, with reduced consumption of foods from own production and increased reliance on processed foods and drinks, high in refined carbohydrates and saturated fat (Damman et al. 2008; Uauy et al. 2001). There is a move away from 'coarse' grain (such as the various millets, buckwheat, and amaranth) to fine grain (white rice and flour); and from traditional snacks and drinks to potato chips, instant noodles, and carbonated soft drinks. The change is fuelled by many factors, not least the intense publicity for processed and manufactured food. Changes are more prominent in middle and lower elevation villages, where road connections are better and market connections have been established. The consumption of traditional coarse grains is often considered as 'backward' in the sociocultural value system (Maikhuri et al. 2001). Rice and wheat have become the main food, a process further reinforced by the decrease in agricultural production of alternatives, supply of HYV seeds at subsidized prices, supply of free food (often rice and wheat) by the government, and low prices and inadequate incentives for traditional crops (Maikhuri et al. 2001).

The replacement of coarse grain with fine grain, and traditional snacks with low nutritional processed and packaged food, has important implications for nutrition status. While total calorie intake has increased over the years, nutritional status has deteriorated (Iyer 2012). Reduced consumption of traditional foods and decreasing activity levels lay the ground for obesity and related chronic diseases. An additional risk factor for chronic disease is poverty (Damman et al. 2008; PAHO 2002), and poverty also plays a role in the move to high energy intense and low nutritious food . Foods from indigenous crops, wild vegetable and fruit species, and animal sources are important sources of micronutrients, however, their consumption has been reduced due to the modernization of food patterns and changes in dietary patterns.

The change in agricultural practices and food habits is further reinforced by the trend towards outmigration and labour for cash income. The rate of outmigration in most areas of the HKH region is very high. While outmigration brings addition financial resources and increases purchasing power to buy food, it can also increase local labour shortages, affecting food production and increasing dependency on purchased food from the lowlands. In some mountain areas, agricultural land is being left fallow (ICIMOD 2014; Rasul et al. 2014; Rasul and Hussain 2015), which reinforces the replacement of nutrition-rich local foods with low nutrition purchased foods.

Increasing Environmental Degradation

The forests, rangelands, and other natural resources in the HKH region are all experiencing degradation and loss. The decrease in forest area and soil quality, increase in mono-cropping, rapidly changing climatic conditions, and water stress are all putting a strain on the agricultural systems (Tiwari 2000). There is a growing water shortage in the HKH region, manifested in decreasing stream discharge, reduced groundwater recharge, drying of springs, and accelerated soil erosion (Tiwari and Joshi 2005). Land use changes and the resultant hydrological disruption have had a direct adverse impact on irrigation potential, which has reduced considerably over the last three decades. The changing climatic conditions are expected to change the conditions for food production by influencing cropping patterns, crop rotation, cropping strength, and cropping intensity, and increasing the vulnerability of local communities to climate change. In the Uttarakhand Himalaya, the productivity of agriculture has declined by nearly 25%, and per capita food productivity has followed a decreasing trend for the last three decades (from 1981–2012) (Tiwari and Joshi 2013). These changes have serious implications for food and nutrition security. Climate change impacts have particular implications for the food security of children and women in the mountains, not least as a result of the projected increase in disasters. At times of disaster, women, particularly mothers, tend to skip meals in order to feed other family members (FSA 2009). During floods, the incidence of waterborne diseases also increases, adding to the challenges of food and nutrition security.

Women displaying traditional food products (from Darchula) in an exhibition in Kathmandu

The Potential of Himalayan Traditional Crops (Neglected and Underutilized crops) in Food and Nutrition Security

The global food supply has increasingly narrowed down to a handful of species to provide the basic diet of carbohydrates, fats, and proteins. Over 50% of the daily global requirement of proteins and calories is met by just three crops – maize, wheat, and rice (FAO 1996) and only 150-200 crops are grown commercially at a significant global scale (FAO 1999b). On the other hand, ethnobotanic surveys indicate that worldwide more than 7,000 plant species are cultivated or harvested from the wild (FAO 1998). A range of agronomic, genetic, economic, and cultural factors have led to thousands of traditional edible plant species now becoming 'neglected and underutilized crops' in terms of their ability to contribute to the world's increasing food requirements (Padulosi et al. 2002). The narrowing base of global food security is limiting livelihood options for the rural poor, particularly in marginal areas of the Himalayas. Traditional crops tend to be quite resilient to a range of agroclimatic adversities and play an important role in marginal agriculture, especially in hilly and semi-arid regions, as a source of both food grain and highly valued fodder.

The traditional crops of today were the major crops of the past. Both historical records of cropping patterns, and the evidence of dietary habits of people in mountain and hill areas, indicate that underutilized crops have a distinct position and a well-defined role in providing food and nutritional security. Current studies and research have shown that traditional crops have an important role to play in people's lives, especially for those in marginalized areas and belonging to marginalized sections of society (Giuliani 2007).

Traditional crops tend to have limited availability globally and there tends to be a lack of information and knowledge regarding their economic potential. These plant species can be locally abundant and have a very high local use (Gruere et al. 2006), but their full potential has yet to be realized (Jaenicke et al. 2006). The constraints include lack of awareness of these species among producers and consumers, lack of markets and/or absence of marketing facilities, lack of policies, and lack of information on the uses and benefits (Jaenicke et al. 2006). The importance of traditional crops and the need for organized research efforts for their development have been highlighted by various researchers including Maikhuri (1996) and Padulosi et al. (2009). Some of the more important traditional species in the Himalayas are listed in Table 12.

Table 12: **Traditional agricultural species in the Himalayas**

Pseudo cereals	amaranth (*Amaranthus spp.*), quiona (*Chenopodium spp.*), buckwheat (*Fagopyrum esculentum; F. tataricum*)
Big millet	sorghum (*Sorghum bicolor*), pearl millet (*Pennisetum glaucum*)
Small millet	barnyard millet (*Echinochloa utilis*), finger millet (*Eleusine coracana*), proso millet (*Panicum miliaceum*), little millet (*Panicum sumaternese*), kodo millet (*Paspalum setaceum*), foxtail millet (*Setaria italica*)
Legumes & pulses	sword bean (*Canavalia spp.*) hyacinth bean (*Lablab purpureus*), grass pea (*Lathyrus sativus*), horse gram (*Macrotyloma uniflorum*), velvet bean (*Mucuna spp.*), winged bean (*Psophocarpus tetragonolobus*), faba bean (*Vicia faba*), moth bean (*Vigna aconitifolia*), adzuki bean (*Vigna angularis*), rice bean (*Vigna umbellata*)
Roots and tubers	elephant foot yam (*Amorphophallus paeoniifolius*), taro (*Colocasia esculenta*), yams (*Dioscorea spp.*)
Vegetables	aibika (*Abelmoschus manihot*), leafy amaranth (*Amaranthus spp.*), brassica spp., kangkong (*Ipomoea aquatica*)

Source: Gupta et al. (2013)

Fields of millets and local Beans in Gatlang VDC, Rasuwa district of Nepal

In recent years many traditional crops have been gaining attention because of their high nutritional value and are now considered as 'nutri-cereals'. Traditional crop species which are rich in micro-nutrients and protein, such as millet and pseudo cereals (se Annex A and B), can contribute effectively to making diets more balanced and can play an important role in combating malnutrition. Minor millet grown in the Himalayas is exceptionally rich in micro nutrients, particularly iron and calcium, and is also high in dietary fibre (Annex A). Pseudocereals have a well-balanced amino acid (protein) composition, with a high content of essential amino acids, superior to that of common cereals (Aubrecht and Biacs 2001; Drzewiecki et al. 2003). Amaranth protein is particularly high in the amino acid lysine – the key component found in insufficient amounts in maize, wheat, rice, and other cereals – and the sulphur-containing amino acids, which are normally limited in legumes (Schoenlechner et al. 2010a). Protein bioavailability in pseudocereals is also high and has been shown in several studies to be superior to that of common cereals and close to the quality of animal proteins (Bressani 1994; Escudero et al. 2004; Gamel, et al. 2004; Li and Zhang 2001). The pseudocereals amaranth, quinoa, and buckwheat are all good sources of dietary fibre (Annex B), with significantly high values in buckwheat, and are generally good sources of iron, calcium, magnesium and other important minerals. They are also good sources of vitamins. Amaranth is a good source of riboflavin (Berghofer and Schoenlechner 2002), quinoa of riboflavin, thiamine, and folic acid (Taylor and Parker 2002), and buckwheat of thiamine, riboflavin, and pyridoxine (Bonafaccia et al. 2003), all B complex vitamins. They are all excellent sources of vitamin E; the total vitamin E content in amaranth, quinoa and buckwheat seeds has been reported to be 5.7, 8.7, and 5.5 mg/100 g dryweight basis, respectively, (Bruni et al. 2001; Ruales and Nair 1993; Zielinski et al. 2001). Amaranth, quinoa, and buckwheat lipids are highly unsaturated, which is desirable from a nutritional point of view. Linoleic acid is the most abundant fatty acid (50% of the total fatty acids in amaranth and quinoa, and approximately 35% in buckwheat) followed by oleic acid (25% in amaranth and quinoa and 35% in buckwheat) and palmitic acid (Alvarez-Jubete et al. 2009; Bonafaccia et al. 2003; Bruni et al. 2001; Ruales and Nair 1993).

Value added products can be developed from traditional crops to provide an additional source of income for farmers. Value addition includes primary processes (wetting, dehulling, milling) and secondary processes (fermentation, malting, extrusion, baking, popping, roasting). Processing should be considered at both traditional and industrial levels, and involving small, medium and large-scale entrepreneurs (Obilana and Manyasa 2002; Hamad 2012) as these are staple crops consumed at the household level. Malt production from millet and sorghum is a traditional practice in Africa; malt is used both in infant food and in the production of a fermented beverage (Adekunle 2012). The emerging uses of millet as an industrial raw material include production of biscuits, confectionery, beverages, weaning foods, and beer (Laminu et al. 2011; Anukam and Reid 2009); and grits, flour, and meal from millet and pseudo cereals are also in demand from urban consumers. Millet and pseudo cereals are a gluten-free cereal and thus suitable raw material for the manufacturing of foods and beverages for people suffering from coeliac disease (Gallagher 2004; Alvarez-Jubete et al. 2010). Germination of traditional cereals is an important processing method to improve nutritive value and functional properties and opens the way to numerous possibilities. Germination of grains was found to increase the content of all vitamins, particularly riboflavin and ascorbic acid, as well as of albumins and alcohol-soluble proteins, and to decrease globulins, while increasing the cooking quality (Colmenares De Ruiz' and Bressani 1996). The lipid and phytic acid content of amaranth decreased with increasing germination time up to 72 hours. There can be challenges in using pseudocereals. The important factors for processing cereal to pasta are good textural quality, low cooking loss, optimal cooking weight, and texture firmness. Pasta produced from amaranth had decreased texture, firmness, and cooking time compared to wheat with research needed to improve pasta quality (Schoenlechner et al. 2010b).

An improvement in the productivity of traditional crops and post-harvest management (processing, storage, and value addition) can go a long way in improving the status of food and nutritional security for people in the Himalayas.

Discussion and Conclusions

The situation in the mountains highlights the urgent need for development planners to integrate policy instruments for nutrition into current policies and programmes on food security. Malnutrition remains a serious challenge in the HKH region, with a large proportion of the population suffering from malnutrition and undernutrition. Some people lack sufficient dietary energy to meet the body's energy requirements; others lack essential micronutrients in their diet and have limited access to safe drinking water and sanitation, which also limits nutrient uptake.

Children, and women's crucial role

Children and women suffer the most. Millions of children in the HKH region grow up without adequate nutrition. Poor nutrition leaves children underweight, weakened, and susceptible to infections. Ultimately they become stunted and deprived of cognitive and learning capacity. Good nutrition for children is essential in order to lay the foundations for a healthy and productive future. Interventions should focus on the period of peak vulnerability, the first 1,000 days of a child's life (from conception to two years of age), when the brain and body are developing rapidly.

The status of a woman's nutrition and her position in the household and society are significant not only for her own wellbeing, but also for the nutrition of her children and whole family. Women should be empowered by improving their knowledge, control of resources, and bargaining power in the household to enable them to make favourable decisions on matters related to family health, education, and feeding.

The mulitsectoral challenge

There are several causes of undernutrition in the HKH region and a number of sectors are directly or indirectly related to nutritional status, including agriculture, health, water, sanitation, education, and the environment. Thus

Maize and grapes cultivation in Yunnan province, China

an integrated approach is needed to tackle nutrition problems. Development policies should recognize nutrition as a cross-cutting issue affecting all areas of development that requires a specific focus.

Poverty is interlinked with – and a major constraint to improving – nutritional status. While poor health and nutrition reinforce poverty, lack of resources to afford an adequate diet and access water, sanitation, and health services reinforces poor nutritional status. Thus poverty alleviation efforts need to be linked to nutrition programmes, particularly for low income groups, while nutrition interventions need to address the underlying determinants of foetal and child nutrition and development.

Changing production and consumption patterns

Food systems in the HKH region are changing; cropping patterns are shifting and agrobiodiversity is declining, food consumption patterns are changing. Nutrient-rich traditional crops are being replaced by energy-dense crops like rice and wheat. The low price of subsidized rice has led to a decrease in consumer demand for traditional crops. The increasing consumption of white rice, wheat flour, instant noodles, and other high-energy low-nutrient refined foods, and declining consumption of nutrient-rich traditional foods, such as sorghum, barley, and millet, is impacting on nutrition and health. These shifts in diet can lead to both undernutrition and overnutrition (obesity), but undernutrition is the main challenge in the HKH region.

Potential of agriculture

Agrobiodiversity and traditional food systems. Traditional varieties of plants are highly adapted to local conditions and are therefore of greater value to mountain farmers than modern varieties: They show a higher resilience to climatic change and add to the diversity of diets, often having very specific characteristics in terms of nutritious content and taste. Abandoning the traditional varieties implies a loss of local farming traditions and reduced global genetic resources. Agrobiodiversity conservation should be promoted and local food production systems rejuvenated. Traditional crops can enhance the stability of local food supplies and reduce dependency on external sources. In addition, having diverse crop species minimizes the risk of complete crop failure due to climatic and biophysical impacts.

Biofortification: The fortification of staple grain flours or processed foods with vitamins and minerals is also an effective way of improving nutrition. The rural poor often live in remote and marginal environments and consume most of the staple foods they produce. Adopting biofortified varieties of these crops can increase the availability of required micronutrients.

Research and investment: Agricultural research, directed at the diversification of crop production and biofortification of local varieties is key. Agricultural investments should incorporate explicit nutrition objectives and indicators.

Policies: The potential of agriculture in improving the nutritional status of mountain people should be realized by introducing appropriate policies and policy incentives, and developing market facilities and value chains.

Economic opportunities

Value chains: Institutional mechanisms are required to support the production, processing, and commercialization of high value cash crops such as fruit, vegetables, and nuts. Mechanisms should improve the supply of inputs, extension services, and access to market facilities to ensure sustainable value chains. This will add economic value to products as well as creating non-farm employment opportunities for local people.

Non-farm income: Rural non-farm economic opportunities such as income from wage-paying activities and self-employment in commerce, manufacturing, and the service industry, are an important resource for rural mountain households, and especially for the landless. Income is crucial to securing nutrition status, enabling better access to food, and increasing diet diversity. In addition, a secure income can also reduce outmigration, particularly of youth, ultimately slowing down urbanization as well as natural resource degradation due to overexploitation.

Agriculture in Charun Oveer valley of Chitral, Pakistan

Higher efficiency: Post-harvest losses in the mountains are very high, particularly losses of fruit and vegetables; there is need to establish fruit processing and vegetable storage facilitates in production areas. In addition, legislation around retail systems should be revised in order to reduce wastage at the retail and consumption levels.

Awareness and knowledge raising

Simply increasing household income and raising agricultural productivity will not be sufficient to combat malnutrition effectively unless several other mediating factors are in place, such as improved education, health, sanitation, and household infrastructure, and improved care and feeding practices for children. Moreover, building knowledge and awareness on nutrition and food preparation is also needed to help improve the nutrition status of mountain people. Within households, a mother's knowledge of nutrition is very important for keeping the balance in the dietary patterns of the whole family, and good feeding and nutritional care practices should be promoted. Moreover, food and water can carry infectious agents; increasing knowledge and improving practices for the safe handling, storage, and cooking of food is important to reduce the risk of infection. Nutrition education should be part of the curriculum in primary and secondary schools.

Water, sanitation, health, and hygiene

Access to adequate water and sanitation is an important measure of the socioeconomic status of mountain households and fundamental to health. Adequate safe drinking water and sanitation are essential for survival and improving hygiene, and are key for reducing the occurrence of waterborne infections such as typhoid, cholera, and diarrhoea.

There is also a need to provide accessible, affordable, and good quality health services – including dispensaries, basic health centres, and hospitals – and to link them with health and nutrition awareness programmes.

Summary

In conclusion, nutrition is of paramount importance to human wellbeing and productivity. As nutritional status depends on a wide array of factors, solving nutrition issues calls for a multisectoral approach with integrated actions to address both immediate and underlying causes, and multi-level response strategies linking curative, preventative, and long-term structural factors. Unless a concerted effort is made to improve the nutritional status in the HKH, the achievement of the SDGs, in particular SDG 2 and SDG 12 will be at risk.

Yak herd in Chitral, Pakistan

Towards an Integrated Framework to Improve Nutritional Status

Although malnutrition is a multidimensional problem that demands a multisectoral approach, nutrition interventions often work in isolation and ignore other agricultural, social, cultural, economic, and public health issues. Nutrition needs to be integrated into all development processes, and targeted nutrition programmes must be combined with poverty alleviation programmes.

Sustainable nutrition security in mountain areas is based on six pillars, namely agriculture, social protection, health services, maternal and child care, water, sanitation and hygiene, and knowledge and awareness. In the following, we describe a framework for an integrated approach to improve nutrition status based on a multi-dimensional approach that integrates nutrition into all development processes dealing with economic, social, agricultural and public health issues (Figure 2). This approach will mainly help in achieving SDGs 2 and 12. It will also contribute to meeting some aspects of SDGs 3, 6 and others.

The key elements – summarized below – provide a basis to stimulate discussion on future action.

Create an Enabling Policy Environment

- Mainstream nutrition aspects across sectors: Increase policy coherence by integrating nutrition security into development policies and programmes and aligning them to nutrition goals. Prioritize nutritionally high-risk areas, communities, households, and individuals such as children, pregnant women, lactating mothers.
- Ensure food safety
- Consider introducing regulations to minimize the promotion of less-healthy foods and beverages, particularly sugar-sweetened high calorie beverages and nutrient- poor fast foods.
- Leverage agriculture for nutrition and health
- Incorporate nutritional aspects into agricultural policies and programmes as well as agricultural extension services
- Intensify research on the biofortification of staple foods for the poor and on product diversification through processing and value addition.
- Incorporate explicit nutrition objectives and indicators into agricultural investments.
- Promote crop diversity and conservation of agrobiodiversity, especially of nutrition-rich traditional crops, and rejuvenate local food production systems. Foster the adoption of biofortified local crop varieties by smallholders
- Create economic opportunities for small scale farmers and the rural poor
- Foster income generation for small-scale farmers by expanding financial and technical assistance and improving the infrastructure and institutional setting for processing and marketing of agricultural produce and value-added products.
- Increase economic efficiency by reducing food loss during processing, storage, and distribution of agricultural produce. Improve legislation around retail system to reduce wastage at the retail and consumption levels.
- Increase rural non-farm economic opportunities by creating and strengthening institutional mechanism to create job opportunities in foods processing, manufacturing and the service industry, with special consideration of youth.

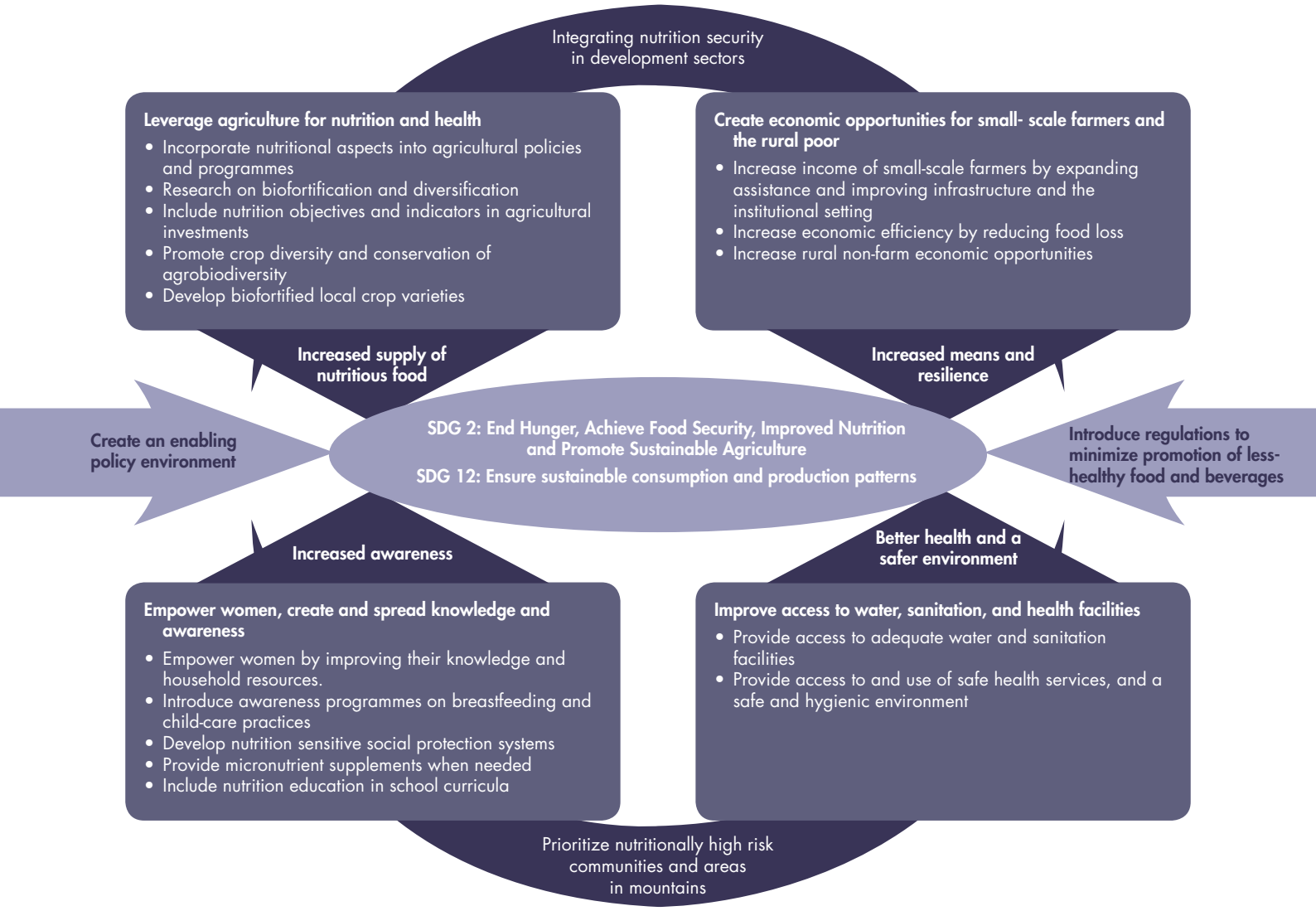
Empower Women, Create and Spread Knowledge and Awareness

- Empower women by improving their knowledge, control of resources, and bargaining power within the household to enable them to make good decisions on matters related to family health, education, and food.
- Create awareness programmes on breastfeeding and child-care practices for (pregnant and lactating) women.
- Develop nutrition sensitive social protection systems and scale them up. Provide micronutrient supplements for children and mothers when necessary.
- Include nutrition education in primary and secondary school curriculums.
- Increase knowledge and improve practices for the safe handling, storage, and cooking of food.

Improve Access to Water, Sanitation, and Health Facilities

- Provide access to adequate water and sanitation facilities
- Improve access to and use of safe health services, and ensure a safe and hygienic environment

Figure 2: **Sustainable Nutrition Security in the HKH Region**



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Annexes

Annex 1

Table Comparison of Nutrition value of small millet with major staple cereals (per 100 gram)

Grain/ nutrient	Pearl millet	Sorghum	Finger millet	Foxtail millet	Proso millet	Barnyard millet	Kodo millet	Rice-milled	Maize	Wheat-flour
Energy (kcal)	361	349	328	331	341	397	309	345	342	346
Protein (g)	11.6	10.4	7.3	12.3	7.7	6.2	8.3	6.8	11.1	12.1
Fat (g)	5.0	1.9	1.3	4.3	4.7	2.2	1.4	0.4	3.6	1.7
Calcium (mg)	42.0	25.0	344	31.0	17.0	20.0	27.0	10.0	10.0	48.0
Iron (mg)	8.0	4.1	3.9	2.8	9.3	5.0	0.5	3.2	2.3	4.9
Zinc (mg)	3.1	1.6	2.3	2.4	3.7	3.0	0.7	1.4	2.8	2.2
Thiamine	0.33	0.37	0.42	0.59	0.21	0.33	0.33	0.06	0.42	0.49
(Vit. B1) (mg)										
Riboflavin	0.25	0.13	0.19	0.11	0.01	0.10	0.09	0.06	0.10	0.17
Vit. B2 (mg)										
Folic acid (mg)	45.5	20	18.3	15.0	9.0	-	23.1	8.0	20	36.6
Fibre (g)	1.2	1.6	3.6	8.0	7.6	9.8	9.0	0.2	2.7	1.2

(Source: Gopalan et al. 1989)

Annex 2

Table 14: **Nutritional composition of Pseudo cereals**

Pseudo cereals	Percent content in dry weight					mg/100gm dry weight			
	Protein	Fat	Total Starch	Dietary Fiber	Ash	Ca	Mg	Zn	Fe
Amaranth	16.5 (± 0.3)	5.7 (± 0.3)	61.4 (± 0.8)	20.6 (± 1.1)	2.8 (± 0)	180.1 (± 6.1)	279.2 (± 1.1)	1.6 (± 0)	9.2 (± 0.2)
Quiona	14.5 5 (± 0.3)	5.2 (± 0.1)	64.2 (± 1.3)	14.2 (± 0.6)	2.7 (± 0)	32.9 (± 3.3)	206.8 (± 6.4)	1.8 (± 0)	5.5 (± 0.5)
Buckwheat	12.55 (± 0.3)	2.1 (± 0.1)	58.9 (± 1.3)	29.5 (± 1.2)	2.1 (± 0)	60.9 (± 3.3)	203.4 (± 8.8)	1 (± 0)	4.7 (± 1)

Notes: Figures in parenthesis are respective standard deviations; Ash contains minerals and trace elements

(Source: Alvarez-Jubete et al., 2009)

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