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Food Production and Consumption in Shah Foladi, Bamyan Province, Afghanistan: The Challenge of Dietary Seasonality

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About LANSAs

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Abstract

‘Assuring global food security’ is among the Sustainable Development Goals (SDGs). Nutrition security focuses on micronutrient-deficiency diseases caused by inadequate intake of vitamins and minerals. In South Asia, as in many other regions of the world where there are high levels of malnutrition, emerging patterns of changes in seasonality as a likely consequence of climate change are threatening the livelihoods and food security of households.

This paper concentrates on agriculture and nutrition in Afghanistan. In the recent Living Conditions Survey 2016-2017 (CSO 2018), food insecurity has increased from 30 per cent in 2011-12 to 45 per cent. This small-scale qualitative exploration of households’ experiences of food and nutrition insecurity aimed to elucidate seasonal drivers and patterns of food production and marketing and also purchase and consumption in Shah Foladi, Bamyan Province.

The household data elicited have provided a wealth of insights into the seasonality of diets and the sustainability of rural livelihoods in the robust conditions of central Afghanistan. We summarise the following key points:

- A longer or shorter period of hunger was reported by most households, and a lack of dietary diversity during much of the year is likely to cause micronutrient malnutrition, especially for the vulnerable groups of children, adolescent girls and women.
- Besides own-production and agricultural sales, household strategies involve access to urban food markets, paid casual labour as well as substantive employment in trade.
- Saving and borrowing matter for all household expenses, but are essential strategies for easing the constraints on consumption and enabling purchase of productive inputs.
- Physical remoteness, poor infrastructure and extreme weather hinder access to markets for products, food, labour and finance.

A range of interventions is suggested, but we note finally that political solutions to the prevailing and worsening insecurity are a pre-requisite to offer hope that sustainable improvement can be made in nutrition-sensitive agricultural development in Afghanistan.

I. Introduction

‘Assuring global food security’ is among the Sustainable Development Goals (SDGs) for the year 2030 to which almost 200 member-States of the United Nations have signed up. Despite significant increases in the numbers of people being fed, about 800 million today still lack food security (IFPRI 2016), and for many the situation is worsening due to factors such as conflict and climate change (FAO et al.2018). Food security is (too) often referred to as the adequate consumption of macronutrients, measured in kcals of food energy per capita (see for example, Ritzema et al. 2017 who use a simple energy-based index of food availability as an indicator of dietary adequacy in East and West Africa). Rather than food security, nutrition security focuses on micronutrient-deficiency diseases caused by inadequate intake of vitamins and minerals. This is contemplated in SDG 2 but not effectively prioritised, despite calls for refocusing food systems on quality of food, not just quantity (Pingali 2015).

Regarding nutrition insecurity, it is estimated that 2 billion people suffer from micronutrient deficiencies, mostly attributable not to lack of food, but lack of diverse and nourishing foods that provide essential micronutrients (CDC 2018). It is now well understood that micronutrient deficiencies in the first 1000 days of life (from conception to 2 years) cause irrecoverable damage to children in respect of growth and development, impaired physical, intellectual, social and reproductive functions, increased susceptibility to other diseases, and premature death. Recent research on stunting in middle childhood and adolescence — one principal cause of which is micronutrient malnutrition — has identified significant gender-based impacts unfavourable to girls (Himaz 2018). This signals the potential catastrophic intergenerational consequences of micronutrient malnutrition.

In the last 10 to 15 years, much research effort has been expended on exploring the nature of, and need for, dietary diversity to overcome micronutrient malnutrition. For rural populations, varied systems of agricultural production have been found to be important factors in enhancing dietary diversity and improved nutrition outcomes. Recent research has thrown up two other important considerations: agricultural production diversity does not necessarily lead to dietary diversity; and markets are an important source of foods even for rural populations. Current literature suggests that the relationships between own-food production, market sourcing and nutritional outcomes are varied or indeterminate, often conditioned by market sales of nutritious foods on the one hand, and market purchases of foods enabled through income from employment on the other (Masset et al. 2012; Jones et al. 2014; Pellegrini and Tasciotti 2014; Powell et al. 2015; Sibhatu et al. 2015; Jones 2017).

Emerging patterns of changes in seasonality as a likely consequence of climate change are threatening the livelihoods and food security of households dependent on their own agricultural production (Savo et al. 2016). Recent evidence of drought and flash floods highlights the challenges to resilience, likely attributable to climate change (OCHA 2018b). More specifically, seasonality promises to be an important factor affecting nutritional sufficiency (Sibhatu and Qaim 2017; Zanello et al. 2017). However, the nature and effects of seasonality on the availability, affordability, and consumption of nutrient-dense foods such as fruits and vegetables have been somewhat neglected in major studies (Miller et al. 2016).

2. Afghan Development Indicators

This paper concentrates on agriculture and nutrition in Afghanistan. While some of the country's development indicators (such as for healthcare) have improved recently, others have stagnated or worsened. In the recent *Living Conditions Survey 2016-2017* (CSO 2018), food insecurity has increased from 30 per cent in 2011-12 to 45 per cent. Moreover, small agricultural plots have undergone a process of fragmentation and overall poverty indices have worsened, compared to previous assessments. The deterioration of many indicators is related to the increasing insecurity, the return of migrants and declining macro-economic conditions. Structural factors affecting development include the low participation of women in the formal economy and in society as well as the low levels of education and skills. **Table I** shows recent key indicators drawn from CSO (2016) which illustrate household-level socioeconomic development parameters.

Table 1: Selected key indicators of nutrition and development in Afghanistan

Population	Per cent
% <15 years	48.4
% >65 years	2.5
Average household size	7.4
Agricultural landholdings: mean size ()	Jeribs (0.2 ha)
Owned irrigated land	6.0
Owned rain-fed land	16.4
Owned garden plot	2.0
Food security: population with	Per cent
Calorie deficiency	30.1
Protein deficiency	19.4
Calorie and protein deficiency	18.5
Literacy: adults >15 years	31.4
Households	Per cent
With improved drinking water sources	45.5
Using solid fuels	79.9
In communities with distance to nearest drivable road of 2 km or less	80
Communications	Number
Mobile cellular subscriptions per 100 inhabitants	14.1
Internet users per 100 population	0.5

Source: Summarised from CSO (2016) pp.i-iii

2.1 The state of nutrition in Afghanistan

Malnutrition is one of the most serious health and development problems in Afghanistan: the latest National Nutrition Survey (NNS) confirms high rates of stunting among vulnerable groups such as children under the age of five (nationally 40 per cent and in certain provinces over 70 per cent) (UNICEF 2014). Additionally, micronutrient deficiencies are strongly implicated in malnutrition among women and adolescent girls (Flores-Martínez et al.2016).

A recent analysis of NNS data examined in detail the geographical differences and determinants of nutritional status at district-level among children and women of reproductive age in Afghanistan by exploring diverse individual, household, community, and environmental risk factors (Akseer et al. 2018). This exhaustive study identified the marked heterogeneity between regions.

However, the study did not explore seasonal differences in food availability. The level and incidence of food and nutrition insecurity vary across seasons, regions and population groups. Generally, food insecurity is higher in the more geographically extreme regions, and coping strategies are likely to be more unviable in these areas than in urban areas. The number of food-insecure households is higher in rural than urban areas, where variations are less pronounced and depend on the operation of markets rather than harvests per se. This suggests that food availability, access and acceptability are achieved better through market acquisition than through domestic own production; and also that rural markets may not be effective in supplementing own production for the rural population that is overwhelmingly involved in agriculture. However, the nomadic Kuchi people enjoy much higher food

security than the urban population (CSO 2016). For the Kuchi, food security depends more on the cycle of productivity and sales of livestock and livestock products than the cropping cycle.

Thus there is some uncertainty about the drivers of food and nutrition insecurity, among which are own food production, access to markets and incomes, and effects of seasonality on production and markets. In the Central Highlands region, in 2014, food insecurity was reported to be lowest in the harvest season at 32 per cent, increasing to 38 per cent in the ‘lean season’, and reaching 56 per cent in the post-harvest period (CSO 2014). In Bamyán Province, food insecurity is among the highest in the country, reported as 72 per cent (CSO 2016).

Understanding the variability and uncertainty characterising food insecurity needs further work. Still less well understood are the varying levels of nutrition insecurity due to micronutrient deficiencies, that is, the variations through seasons, regions and population groups of a qualitatively inadequate diet. This report addresses the lacuna in documenting the role of agriculture in the seasonality of nutritional insecurity for a particular group of people in Afghanistan.

2.2 Dietary diversity

Low dietary diversity is an important dimension of nutritional insecurity. According to CSO (2016), 41 per cent of the rural Afghan population suffer from low dietary diversity, measured by the Food Consumption Score (FCS) (World Food Programme 2008) (**Table 2**).

Table 2: Dietary Diversity Score (mean) and percentage of households with low dietary diversity

Population	Dietary diversity score (mean)	Low dietary diversity (%)	By food consumption group (%)		
			Poor <28	Borderline 28-42	Acceptable >42
Urban	5.7	20.0	16.1	38.1	45.8
Rural	4.8	41.7	26.3	34.8	38.9
Kuchi	5.0	40.8	11.0	39.4	49.6
Region					
Central	5.7	19.7	12.1	40.2	47.6
Central Highland	4.3	55.7	33.3	26.4	40.3
Eastern	5.7	16.1	3.8	41.0	55.2
North	5.0	37.7	28.9	37.5	33.6
North-East	4.5	54.2	38.1	28.6	33.3
South-East	5.3	30.7	20.9	40.1	39.0
South-West	5.4	28.2	24.9	40.4	34.7
West	4.5	52.0	25.6	33.2	41.2

Source: Summarised from CSO (2016), p.105, 106.

In some provinces, the lack of dietary diversity is extreme: in a number of remote provinces where geographical conditions are harsh, including Bamyán, the diets of more than 70 per cent of households exhibit low dietary diversity (CSO 2016):

Households with a poor consumption pattern tend to eat almost no fruits, dairy products and meat/eggs, and nutrient-rich foods such as pulses only occasionally. Their diet predominantly consists of wheat, oil and sugar only. Households with borderline consumption eat fruits, dairy products, meat/eggs and pulses on average one day a week of each item. Households with acceptable food consumption eat meat/eggs and pulses approximately two days per week, while dairy products four days a week (CSO 2016).

What these data only hint at is the variability in diets throughout the year, and the impacts of extreme weather conditions on production and consumption.

2.3 Agricultural systems and diets in Shah Foladi

The Koh-i-Baba mountain range in Bamyan Province is an extension of the Hindu Kush, constituting the southern rim of the valley running through Bamyan and central Afghanistan. It rises to its highest at Shah Foladi Peak (5050 m), immediately south of Bamyan City (**Figure 1**). In 2017, the Afghanistan National Environmental Protection Agency declared part of the region as Afghanistan’s most recent protected area covering 2700 km²:

In the midst of an arid country, the Shah Foladi area is covered with snow throughout most of the year and is a nationally important watershed that feeds nearly all of Afghanistan’s major river systems, including the Harirud, Helmand, Kabul, Kunduz, and Balkh rivers. Much of the area also consists of high elevation rangelands that support diverse wild plant and animal species, and provide the local population with vital plant species for fuel, food, and medicine, and the means for animal production’ (UNEP 2017).

Figure 1: Bamyan Province, Afghanistan



Using irrigation water from the mountains, Bamyan has become the centre of a thriving potato-growing industry which has changed production patterns and has influenced economics and diets significantly in the last 15 years (Ritchie and Fitzherbert 2008; potatopro.com 2017). For many small-scale producers, annual legumes and pulses have been replaced by potato production as a staple cash crop to the extent that potato is a monocrop within a small radius of Bamyan City, with inherent dangers ‘in such a fragile and vulnerable agro/economic environment’ (Ritchie and Fitzherbert 2008:8).

Table 3: Afghan and Western names for months

Afghan	Western	Afghan	Western
<i>Dalwa</i>	January-February	<i>Asad</i>	July-August
<i>Hoot</i>	February-March	<i>Sonbula</i>	August-September
<i>Hamal</i>	March-April	<i>Mizaan</i>	September-October
<i>Sawer</i>	April-May	<i>Aqrab</i>	October-November
<i>Jawza</i>	May-June	<i>Qaws</i>	November-December
<i>Saratan</i>	June-July	<i>Jadi</i>	December –January

For Afghanistan as a whole, the harvest season is from May to July (*sawer-jawza-saratan*) for the main staple cereals of wheat, maize and barley. The post-harvest period is usually from August to mid-December (*asad-jadi*), and pre-harvest (the so-called 'lean' season) is generally from mid-December to April (*qaws-sawer*). However, there is considerable variation throughout the country. The Central Highland province of Bamyan is marked by extreme seasonal effects not least due to altitude. Together with Badakhshan in the Northeast Region and Panjsher in the Central Region, Bamyan experiences 'severe winter conditions' and a 'lean season' of up to six months lasting from November to April (CSO 2014:180). The increasing frequency of unseasonal meteorological disturbances affects production and livelihoods in a region already under climate stress (OCHA 2018a). Under these harsh conditions, and with limited food storage and preservation, dietary diversity is compromised by highly seasonal production of nutrient-rich foods such as fruits and vegetables, dairy produce and other animal source foods (ASFs). Minimal sources of winter employment and logistical conditions which limit the market availability of diverse foods result in low economic and physical access to markets.

3. The Research Approach

This research study in Bamyan aimed to elucidate seasonal drivers and patterns of food production and marketing as also purchase and consumption in Shah Foladi. Household food consumption surveys are the single most important source of data on dietary adequacy but there is no particularised approach, and there are many shortcomings in practice (Zezza et al.2017). The study reported here was a small-scale qualitative exploration of households' experiences of food and nutrition insecurity in Shah Foladi. Fourteen cases of household interviews were used to elicit recall data on annual food production and consumption, as well as agricultural livelihood practices and intra-household dynamics. Given the broad understanding of seasonal dietary patterns from secondary data reported above, the intention was to understand what factors affected food consumption and the limited dietary diversity in the 'lean' season. Adapting the standard approach of the World Food Programme and other organisations (World Food Programme 2008), the intention was to investigate seasonal dietary diversity and the frequency of consumption of 12 major food groups and, if possible, consumption of particular food items such as the variety of dairy products that are widely reported to be important to the Afghan population.

The common approach of 24-hour recall was rejected because it fails to capture any sense of seasonality without multiple surveys (Sununtnasuk and Fiedler 2017). Similarly, diaries were not considered appropriate in a largely illiterate population. In some circumstances, recall data over long

periods have been found to have a useful degree of accuracy (Berney and Blane 1997). Whereas the standard approach uses a 7-day period, recall data over a one-year period is likely to have a low level of precision. In fact, both recall data and diary data on food consumption and expenditure have been criticised as inaccurate (Naeem Ahmed et al. 2006; Brzozowski et al. 2017). Thus the limitations of the methodology used are significant. For these reasons we did not ask about food quantities and consumption by individual household member, and we do not try to arrive at a definitive food consumption score. Within the constrained environment of rural Afghanistan, the research focused on patterns of food supply and consumption, and indications of the range of consumption of particular foods over the year.

Another important limitation concerns any conclusions about the adequacy of the diets recorded. While the adequacy of diets can be inferred from estimates of the nutrient content, frequency of consumption of foods, and estimates of dietary requirements, it is not possible to point to individual nutritional requirements and deficiencies; precision in estimating dietary requirements is not possible because these will vary depending on an individual's age and stage of development, level of activity, gender, health status, and interactions between these factors, and the specific micronutrients of concern. Secondly, as implied in the above discussion, obtaining precise data on nutrient intakes requires a sophisticated level of experimental design that was impossible under the prevailing research conditions.

There are two reasons to argue for cautious acceptance of the findings: first, mostly after the age of six months, and almost definitely above the age of one year, all household members were reported to eat the same foods, irrespective of age, gender and other variables, such that a 'household diet' is a valid concept; second, through the validation process described below, workshop participants and stakeholders endorsed the data on patterns of consumption.

4. Methodology

4.1 Questionnaire design

The household questionnaire was designed and tested by SOAS University of London and staff of the Bamyar NGO, Ecology and Conservation Organization of Afghanistan (ECOFA), who were familiar with the region and the individual villages, and were known personally to many of the households. It covered household demographics; agricultural production systems, storage and sales; labour inputs; and food consumption and purchase patterns. It was implemented in the Dari language by local staff of ECOFA. Notes taken during the interviews were translated into English and entered into the questionnaire for analysis by the research team of ECOFA and SOAS University of London. ECOFA staff was supported significantly throughout by the national office of the United Nations Environment Programme (UNEP).

4.2 Implementation and sampling

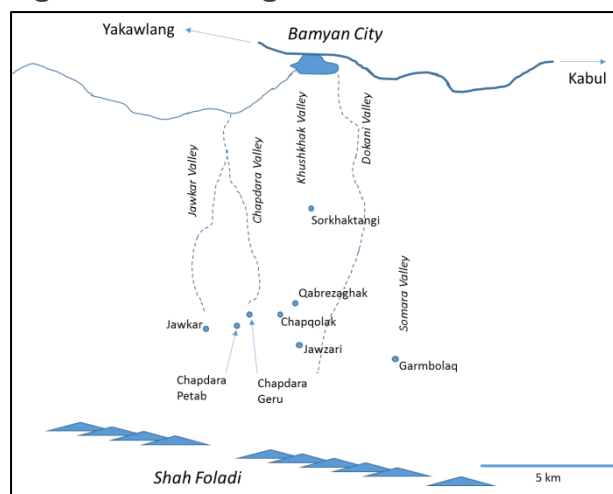
Fieldwork was conducted between August-October 2016. Partly for reasons of feasibility and prevailing insecurity, a small-scale qualitative approach was used. Sampling was purposive. Eight villages in the Shah Foladi area were selected: Chapdara Geru, Chapdara Petab, Chapqolak, Jawkar, Jawzari, Qabrezaghak, Somara Garmbolaq and Sorkhaktangi (**Figure 2**). They were from villages

with which ECOA was working on related environmental development topics. This was the first research undertaken by ECOA on food consumption. Individual households were selected by the NGO in discussion with the head of the Community Development Councils to cover the range of poorer to better-off households, and people with whom there was a relationship of trust regarding the reliability of data supplied (**Table 4**).

Table 4: Villages and sampled households

Village	Case	Altitude (masl)	Distance to market
Jawzari	1	2912	20
Jawzari	2	2977	20
Qabrezaghak	3	2833	18
Garmbolaq	4	3016	20
Sorkhaktangi	5	2826	8
Sorkhaktangi	6	2833	8
Jawkar	7	3152	24
Jawkar	8	3154	24
Chapqolak	9	2990	25
Qabrezaghak	10	2830	20
Chapqolak	11	2990	25
Chapdara Petab	12	2990	20
Chapdara Geru	13	2990	26
Chapdara Geru	14	3020	25

Figure 2: The villages



4.3 Interview dynamics

In each village, an initial discussion group was held to inform all residents of the purpose of the research. There were four interviewers, two men and two women. After the initial village meeting, the men in the selected households were interviewed by the male interviewers and the women were interviewed separately by the female interviewers. The interview process took up to two hours per household. The interviews with the men discussed the topics of food production and consumption in a general manner. Interviews with the women elicited more precise details about

consumption patterns, food sourcing and intra-household distribution. In one household, female members were not allowed to participate.

As noted above, there is no claim that the households were statistically representative. Nevertheless, comparison of data for the selected households with public data such as the National Risk and Vulnerability Assessment (NRVA) suggests that the households were well within the normal distribution (**Table 3**, cf **Table 1**). Data quality were scrutinised first at a one-day knowledge exchange and validation meeting in July 2018. This meeting in Bamyan City included about 55 people, approximately equally women and men, from participant and non-participant households and also staff from other NGOs working in Bamyan and neighbouring provinces. Besides discussing the findings in greater depth, the exchange was a data validation exercise. The consensus at the meeting was the data were reliable for much of the Central Highlands region of Afghanistan. Other provinces neighbouring Bamyan are more remote and inaccessible, and people in the least favoured areas are likely to be as challenged as the inhabitants of Shah Foladi in respect of dietary diversity throughout the year. It is both the norms and the differences or outliers within the sample which are informative, and the results presented below represent the range of responses.

A second higher-level knowledge exchange event was held in Bamyan City in July 2018 with national and international stakeholder and policy organisations. Participants included staff of NGOs (some of whom had attended the previous meeting), provincial government officials and provincial staff of ministries of the Government of Afghanistan, including the Department of Agriculture, Irrigation and Livestock and the Department of Education. A third workshop was held in the British Embassy in Kabul, also in July 2018, with DFID staff and members of some NGOs.

The findings reported in the next section below draw on the transcripts of the interviews and use illustrative quotes of respondents. Households' locations are given but identities are anonymised.

5. Findings

5.1 Characterising households

Table 5: Descriptive statistics (n=14 households)

	Minimum	Mean	Maximum
Household characteristics			
Children <15 years	0	2.6	6
Adults 15-64 years	2	5.2	17
Adults 65+ years	0	0.2	1
Total household	4	7.9	20
Income from agriculture (%)	0	51	80
Income from livestock (%)	0	35	50
Income from other sources (%)	20	63	100
Adult literacy	0	0.5	2
Agricultural production			
Altitude of household (meters)	2826	2961	3154

Arable land cultivated (hectares)	0.2	0.7	40
Probability of wheat cultivation	0	0.9	1
Probability of potato cultivation	0	0.9	1
Probability of barley cultivation	0	0.5	1
Probability of oats cultivation	0	0.1	1
Probability of vegetable cultivation	0	0.8	1
Distance to market (km)	8	20	26
Livestock production			
Probability of alfalfa cultivation	0	0.9	1
Ownership of cows	0	0.9	3
Ownership of ox	0	0.1	1
Ownership of sheep	0	9.9	20
Ownership of goats	0	1.4	5
Ownership of poultry	0	1.3	6
Ownership of donkeys	0	0.5	1

Table 5 shows descriptive data – the range and means – for household composition and economic variables. Compared with the key indicators from NRVA (**Table 1**), households were of a similar size but had more adults and fewer children. Literacy levels were low among adults. Children – boys at least – mostly attended school, subject to weather and working conditions, but access difficulties were a real constraint, especially for girls:

‘It is very important for our boys to go to school.’ [9]

‘Due to remoteness of the village, most of our children can’t reach school and girls can’t progress to higher levels of education.’ [3]

Two families of which the parents were illiterate had two children who had graduated from Bamyán University.

5.2 Farming systems

Agricultural systems have responded to market incentives, have intensified somewhat and become more profitable:

‘Before the last 12 years there was no potato planted, only wheat and barley, but now the villagers are planting potato, wheat and barley. Potato grows well in this village, it is high-value and is easily marketed.’ [4]

‘According to customs of the past, wheat and barley were grown mostly but in the past 12 years people have started growing potatoes, which have better yields.’ [5]

‘In the past, people cultivated barley, beans and wheat that had lower profits but recently people cultivate potatoes and use agrochemicals that didn’t exist before. Nowadays people have increased production and household income greatly.’ [6]

Although farm sizes were small, one limitation was the lack of water:

‘This village doesn’t use all its land due to lack of water and can’t grow other vegetables so there is a great need for a water management system.’ [10]

‘Due to lack of an irrigation system, we cannot use most of our farmland.’ [11]

All households, but one, cultivated wheat and potatoes, primarily for own consumption but also for sale. Barley was cultivated by half the households and oats by only one. Production of grains and potatoes was generally rotated, and in most cases these major crops benefited from the application of natural and/or inorganic fertilizers. Seeds for staples were sometimes saved, sometimes purchased:

'We buy seeds from the bazaar and use local seed.' [11]

All households, but one, cultivated alfalfa for livestock feed. Most households cultivated some vegetables, but in small quantities:

'Mostly the villagers don't grow vegetables due to lack of irrigation.' [7]

5.2.1 Gender and labour

In many, but not all, households, agricultural responsibilities were shared by men and women:

'Women in our family have a big part in agriculture, from preparing the land to collecting/harvesting the produce because this family has no workers and also not enough money to employ workers.' [3]

'Women in our family play big roles in agriculture and work shoulder-to-shoulder with the men. Women work on land as well as do home activities.' [7]

For one household:

'Women in our family have no roles in agriculture because it is not part of the household activities.' [10]

5.2.2 Livestock and dairy

All households but the outlier kept livestock: a cow, and a mean figure of almost 10 sheep. There were fewer goats and poultry. Half of households had a donkey – important for land cultivation and personal transport, and only one had an ox. Livestock were grazed on the rangelands above the villages for 7 months (sheep) and 5 months (cattle) [4], and otherwise overwintered on stored fodder within the household compounds. There was a keen awareness of the need to manage grazing to ensure conservation:

'We do not use one area for grazing only; for livestock we change the grazing area each month to preserve the rangelands from over-grazing.' [1]

Herding livestock was often undertaken by children, both boys and girls, but milking dairy animals and processing of milk were almost exclusively women's responsibility. Milk was collected from both cows and sheep and commonly made into different types of cheeses, oil and yoghurt. Milk and derived products were almost always consumed entirely by the household.

In almost all cases, labour was provided by the household. One household [12] exceptionally employed a shepherd, although there were children who could have assumed this responsibility.

5.2.3 Storage

Grains were stored in the house, and potatoes also, if they were not stored outside in a pit, 'for three or four months (qaws, jadi, dalwa and hoot)':

'Most of the people are storing crops inside the home, but some prepare a special place like a cellar that is mostly used for potato.' [11]

Potato losses due to inadequate storage were frequently cited as a problem:

'Lack of suitable storage and long cold winters cause crops to spoil.' [1]

'Storage is not adequate, so usually potatoes are spoilt.' [5]

5.2.4 Infrastructure

Weak public infrastructure, including lack of all-weather roads and bridges, affected households in diverse ways:

‘Due to the lack of road, this village has no access to car transportation and the private car costs a lot of money to even come into the village which is a big economic problem, so if we had proper roads the hire rates of cars would be lower and we would have access to clinics and the market easily.’ [6]

Poor local irrigation systems were also a source of loss:

‘Due to damaged canals most of the water is wasted, causing drought... Due to the lack of water, people can’t cultivate most of their lands so their income is very low and they’re not able to prepare good food for their family.’ [6]

5.2.5 Engagement with product, labour and financial markets

Much of the households’ income was derived from arable agriculture (sales of potatoes) and most of the rest from livestock — sales of lambs/kids and calves. One outlier did not engage in agriculture but depended entirely for income on full-time employment. The household owned little land and borrowed a plot to grow a small area of potatoes:

‘Because we don’t have a lot of land, a small piece of land is borrowed to meet the needs of the family.’ [13]

They also kept 3 sheep and 3 chickens. An unusual characteristic was that they moved closer to the bazaar during the winter months:

‘Due to cold weather and bad conditions of the roads, our family moves near the market in winter to meet its financial and dietary needs by working in the market and coming back to the village in the spring.’ [13]

For two other households, employment contributed 70 per cent and 20 per cent of income, respectively. In one other household, there was a schoolteacher and a part-time worker in the hotel sector, whose employment contributed 60 per cent of household income, as well as one son studying at the Bamyán University [2]. Other households engaged in seasonal paid labour when available. The distance to market ranged from 8 to 26 km. Interviewees were not asked about credit or formal financial services, but from the responses of five households, it was evident that borrowing from storekeepers in the bazaar and from friends was an important strategy, and sales of potatoes were important in clearing debts:

‘Sometimes whenever physical cash is not available, we take money from a friend or borrow from shopkeepers.’ [14]

Another outlier was the household of a father and mother and three adult children. The father was a tinsmith whose sales in the bazaar over a two-month period contributed 70 per cent of income. The remainder of income and subsistence was derived from agriculture, including a significant plantation of 34 fruit trees. Few households actually benefited from fruit and nut trees, but recent plantings appeared to offer better prospects.

5.2.6 Impacts of seasonality

Seasonality is an acute fact affecting many aspects of life:

‘During the winter months there is very heavy snow in the village and the weather is very cold while we do not have enough facilities and we are suffering from this condition. It affects our life on every level, such as food and clothes and all our needs. In the other seasons of the year,

life is good, we can farm our land, we can go to the bazaar, we can work and also we do not need a lot of fuelwood.’ [6]

‘The mountains here have little firewood; that is not enough for the winter, so people spend lots of their income on purchasing fuel.’ [7]

‘If women have the duty of collecting water, men have to collect the firewood from the mountains.’ [6]

‘This village has a spring that is far away from homes and especially in winter it’s a big problem for the girls to fetch water.’ [7]

‘In winter, our children [usually the daughters] face horrible problems and accidents bringing water from the water source to home.’ [13]

‘There is a spring far from the village and it is hard for us to bring water from there, especially during the winter.’ [11]

For some households, access to fuelwood was a driver of food consumption practices, while others were unconcerned:

‘We try to cook food that needs less firewood. At the end of winter and start of spring usually we face lack of firewood because the stored firewood finishes and due to the rain we can’t gather firewood so we try to use less firewood.’ [6]

‘Eggs take the least fuel but we do not consider this.’ [1]

5.3 Household food supply strategies

Seasonality was the primary determinant of food consumption patterns, as indicated by one household whose experience applied to all:

‘The pattern of food consumption varies across the different months of the year, according to seasonality and market access. Most foods are not available or accessible in winter.’ [10]

For some households, there was not a problem of prolonged hunger:

‘We have not faced such a time [of hunger], but some families have faced this in the past. Nowadays people deal with hunger when crops are running low at the end of winter, but we rarely face lack of food.’ [2]

‘This family has never faced this problem.’ [5]

5.3.1 Purchases

Essential items that could not be produced at home were sourced exclusively from the bazaar in Bamyán City because there were no local retail outlets:

‘For purchasing salt, tea, cooking oil, shopping is done at the bazaar’. [14]

Access to Bamyán City was either on foot or donkey, or by motorbike or the shared hire of a car. Usually it was the men who went to the bazaar, but not always:

‘All the family members can go according to their needs, but generally men go.’ [5]

‘The men purchase the food items.’ [14]

Poor logistics and insecurity were reported to impede access:

‘Usually due to cold weather and snow falling in winter, roads are blocked, causing prices to increase, and sometimes bad security and attacks on the highways cause the same problems.’ [7]

5.3.2 The ‘lean season’

Respondents were aware of the significance of dietary diversity but prevailing conditions constrained choice:

‘Most fresh foods like vegetables, fruits, dairy products and wild foods are all heavily dependent upon seasonality.’ [8]

Despite the two cases cited above, the majority of households were primarily concerned about hunger, and these food needs were met by a basic daily diet of bread and tea, consumption of which was accompanied by sugar, sweets and occasional luxuries like chocolate:

'The three or four staples that make up the diet never change... All family members drink tea with chocolate and use sugar with tea in the mornings.' [12]

Bread was most commonly made from own-produced wheat which was milled by local or by itinerant millers. Some households supplemented the wheat in bread with barley. Like bread, potatoes were eaten on a daily basis. Home-produced wheat flour and potatoes were supplemented during the winter, and then entirely replaced as spring progressed, by market purchases, first of potatoes and subsequently of wheat. For its better bread-making characteristics and flavour, home-grown wheat was preferred to purchased flour which is usually imported from Kazakhstan. Rice was eaten almost as frequently as wheat and potatoes, always purchased from the bazaar. 'Essentials' such as tea, salt, cooking oil, and sugar and sweets were sourced from the bazaar, with stocks purchased before winter conditions prevented access:

'It is very hard for us to go to the bazaar during the winter but it is not impossible. The weather is very cold in this area and during the long winter (5 months) our daily activities decrease and some of the days are fully taken up by ploughing snow from the roof. During the warm seasons we can do our daily activities regularly; working on the land, going to the bazaar, and planting.' [7]

Households gave varying responses concerning the 'lean period'. This was discussed at the workshop in July 2018, but a definitive and common calendar could not be deduced:

'Lack of food occurs at the end of winter (hamal) when there is little storage left.' [9]

'The spring season (hamal and sawer) we face prolonged hunger because all stored produce is finished and that is the worst season when there is no money to purchase things and no time to go to market and borrow products.' [6]

'Food stores finish in June and July (jawza and saratan) before new crops are harvested. People in this village suffer hunger all year round and mainly eat bread, rice and potato.' [1]

'August and September (asad and sunbola) are the hungry months because the stored products are finishing and new products are not available.' [13]

Depending on farm and household size, stores of own-produced wheat and potatoes were exhausted at different rates, sometimes months before the new harvest in August-September (*asad* and *sonbula*). Thus the timing and the concept of the 'lean season' varied between households. 'Hardship' from November-February (*qaws, jadi, dalwa*, and into *hoot*) was one defining element, but 'hunger' became relevant once food supplies ran low. Thus the 'lean period' set in once food stores ran low, before the bazaar could be accessed for purchases and credit, and before the labour market opened (March onwards).

Depending on the availability of financial resources, 'hunger' could persist well into the new growing season — potatoes being planted from March-April (*hamal*), and vegetable crops somewhat later. The new harvest brought definitive relief from hunger.

5.3.3 Food prices

Seasonal prices for staples, like vegetables and fruit, were said to double, or more, between summer and winter:

‘During the spring potatoes are very expensive, the price is almost double compared to the other seasons... prices depend on the season: the fruits that come to the bazaar during the warm seasons like grapes are cheap, but become expensive during the other seasons — almost double the price. Vegetables are the same as fruits.’ [5]

Another household [10] commented that seasonal prices were too high to permit purchases of potato in July-August before harvest (*asad*) and meat in February-March (*hoot*). The other financial element besides savings, labour and credit that contributed to household budgets was product sales: livestock in June-August (*saratan* and *asad*), even into September-October (*sonbula* and *mizaan*); and potatoes in August-September (*asad* and *sonbula*).

5.4 Food categories

Table 6 aggregates the data from all 14 interviewed households and summarises the ranges of responses concerning the source and frequency of consumption of food items from the major food categories throughout the year. The source of foods was own production and/or purchased from the bazaar in Bamyan. Seasons are broken down into quarters. The frequency of consumption is expressed as an aggregate of responses (with some outliers marked ‘?’).

In brief, the tendency to eat starchy staples more frequently is evident. Similarly, the tendency to eat the nutrient-rich categories of fruits, meat, eggs, and dairy less frequently is evident. Consumption of pulses was zero except for one household, and then consumption was very rare. Nuts and seeds such as walnuts and almonds, which are an important and nutritious category of products in Afghanistan, were rare luxuries.

Cooking oil/butter made from own-dairy production and purchased was eaten daily, the significance of which is that purchased oils can be fortified with fat-soluble vitamins A, D, E and K (World Food Programme 2018).

Sugar and sweets provide pleasure and energy, as well as pre-disposing consumers to health hazards. Herbs foraged from the rangelands over a very short spring/summer season are eaten raw and incorporated into cooked dishes, and besides their flavours are considered to confer nutritious (e.g., vitamin C) and medicinal benefits.

Overall, it is evident that the consumption of nutrient-rich foods is at best occasional in the autumn and winter periods, and infrequent in spring.

Following **Table 6**, we present quotations from the interview transcripts on the major food categories which illustrate salient points about seasonality and frequency of consumption.

Table 6: Source and frequency of food consumption by category

Foods	Main source	Season/quarter	Daily	Weekly	Monthly
Wheat	own/purchase	all seasons	1-2	1-5	
Rice	purchase	all seasons			
Potato	own/purchase	all seasons	1-2	1-4	

Vegetables*	own/purchase purchase	summer/autumn winter/spring	1-2 1?	1-4	1-2 1?
Fruits	own/purchase	summer/Ramadan		1-2	1-2
Meat Eggs Dairy	own/purchase own/purchase own	spring/Eid all seasons/Eid spring/summer autumn/winter	1	1 1-2? 3-5 1?	1-2?
Pulses	purchase	all seasons		1-2?	1-2?
Nuts/seeds	purchase	autumn/winter/ Ramadan/Eid			1
Oils/fats	own/purchase	all seasons	1-2		
Sugar Sweets	purchase purchase	all seasons Ramadan/Eid	1-2 with tea 1-2	1-3?	1
Forages	collected	spring/summer	1?	3?	1-2?

* Onions were consumed more frequently than other vegetables
 ? indicates outlier responses

5.4.1 Vegetable and fruit consumption

A wide range of vegetables was accessible in the bazaar throughout the year, but in the winter, according to interviewees, at a much elevated price (at least double) and at the cost of arduous travel. The period from March-November offered easier travel to the city and lower prices. Home-grown vegetables (carrot, radish, onions) were available May-June onwards (*jawza*), eaten once or twice, or sometimes more often during the week. Carrot, radish, onion, turnip, leek were purchased by most households from the bazaar, maybe once or twice a month during the summer (*saratan, asad, sonbula*).

For the few households who consumed home-grown fruits (apples and apricots) these were, like bazaar fruit, available late in the summer. Purchased fruits were largely watermelon, apples, apricots, grapes and melon; dates and pomegranates also figured among the fruits consumed. However, most households consumed fruits only rarely, maybe once per month in the summer, and in association with Ramadan and Eid. Similarly, livestock products were a luxury often limited to festivals:

'During Ramadan or during Eid we use our own products but sometimes items are purchased from the market.' [12]

Summer visits to the market for any purchases could be as infrequent as every two or three months for some households. For one household, most fruits and vegetables were not eaten more frequently than once a month, and only in summer [12]. Vegetables were home-produced and fruits were purchased.

Foraged foods were accessible from the rangeland in spring to summer months, but were consumed infrequently, and only by four households. Among wild plants, each only available for one month, those cited included *shirish*, *bolo*, *chokri*, *sharsham*, *gandomak*.¹

Responsibility for collection of herbs was shared:

‘Men and women both collect herbs, so according to their schedules they are responsible for natural resources an almost even amount.’ [6]

5.4.2 Meat consumption

Most households commented on the importance of festivals and that, as noted above, luxury items like fruits, meat and sweets were commonly consumed then:

‘Consumption of livestock products is common at religious festivals like Ashora, Moharram, and Eids. Food is purchased from the bazaar.’ [1,2]

‘For the Eid celebration all villagers get together to purchase a cow or sheep and slaughter it to share with all the families.’ [8]

‘All consumption of livestock is from our own products for Ramadan, Eid and Moharram. But in Moharram people share.’ [9]

Even the better-off family [5] commented:

‘We rarely eat meat because meat is expensive.’

5.4.3 Dairy consumption

As noted, dairy products were important (*qurut*, butter, *chakha*, yoghurt, *maska*, cheese and milk were cited), and were 100 per cent consumed by livestock-owning households with a frequency from daily [4] to 3 to 5 days per week during the spring and summer period (*jawza-saratan*). One household [3] reported that sheep milk was only available for two months in the year. There was little consumption in the autumn and winter periods: one household consumed *qurut* [4] outside the spring and summer months. Other households [9] claimed to consume home dairy products over a three-month spring-summer period and butter and oil occasionally during winter; and yoghurt and milk over a four-month spring-summer period [11].

Only one household reported that dairy products were consumed most days for 11 months of the year [5], while another claimed to consume a range of dairy products throughout the year [14]. This could imply storage of less perishable products such as hard cheese, but this family was apparently better-off, exceptional in migrating towards Bamyan City during the winter and in having a trade and income outside agriculture, so more likely was able to purchase dairy products throughout the year. This datum was not explored further.

5.4.4 Pulses, nuts and seeds

Pulses were not grown by any of the households, and were bought from the market by only a few households and consumed no more than once per week, more commonly once per month. For some households, consumption was less frequent or zero.

Consumption of nuts was almost zero, only at festivals, but one village had planted almond trees which were not yet ready for harvest. For one household, nuts were consumed on special occasions:

‘... around once/ month or according to economic situation and at some ceremonies like Eid, also for guests and other events.’ [14].

¹ For further information, see Fitzherbert, A. (2014). *An Introductory Guide to Sources of Traditional Fodder and Forage and Usage: Environmental Resilience in Pastoral Systems in Afghanistan*. Kabul, United Nations Environment Programme.

5.5 Food distribution

In some households, no distinctions were made in diets for different household members who might be nutritionally vulnerable:

'There is no special food for women, lactating mothers, adolescent girls, children. They eat the same food because there is no choice to eat differently... [For infants] from 9-10 months age semi-solid foods start and from 2 years of age solid food is introduced'. [11]

Other households showed some differentiation:

'Usually breast-feeding mothers eat more meat, oil and vegetables, and more fruit and vegetable for adolescent girls and children and infants.' [14]

'Sometimes women in this family use rich foods [during pregnancy and lactation] due to low blood pressure... For a short period their food varies to include more nutritious food like meat, butter and sweet dishes.' [13]

Special food requirements for a mother after giving birth were not commonly cited. One household said:

'For the first 10 days after child labour, women eat a kind of food called kashkaw (a stew of vegetables, beans and noodles). After that, all family members eat the same food.' [1]

Solid foods were introduced to infants from the age of six months, or sometimes one year.

Thereafter, the starch-based diet supplemented by tea was dominant throughout the year for all members of the household, shared equally without regard to age or gender. Neither children nor pregnant women received a different diet. Regarding infants:

'After 6 months semi-solid foods are introduced and after one year children are given the same food as the rest of the family.' [2]

'After 40 days sometimes we start feeding them with dried milk, and we try to make a watery food for the family in order to feed it to infants as well. This continues up to six months. The children also get special biscuits. After six months all foods are mashed and given to the child, and after one year the child eats whatever the other family members eat.' [6]

'All family members drink tea, with bread. We use sugar rarely as it is expensive. If it is used, it is mostly at the end of Ramadan.' [1]

'All family members use the same food... All family members drink tea with chocolate and use sugar with tea in the morning.' [5]

'Food is distributed by the mother of the family and she is the only decision maker, she tries to give more food to men because they work hard and need more energy and other family members eat according to their needs'. [6]

5.6 Festivals

Festivals, in particular Islamic religious festivals, are a major cultural event, and a time for celebration, which includes consumption of luxuries.

'In Ramadan, the diversity of food becomes better; we use meat, fruits and vegetables that are mostly purchased from the bazaar. Also during the Eids (3 festivals per year) people are using the best foods. In the Moharram month all the villagers are using kocha which is a kind of local food made from wheat and meat in the mosque.' [4]

'On religious occasions we try to use our own products; otherwise we purchase it from market. During Eid, all villagers get together and purchase a cow or sheep to be shared with all the families.' [7]

For some households, such treats were confined to the Islamic New Year, Moharram (12 September in 2018):

'There are no particular programs for the Eid celebrations and only on religious occasion like holy month of Moharram, we use our livestock products.' [3]

5.7 Women's role in decision making

Production, harvesting, sales and storage decisions are critical household functions. As noted, there were diverse views on women's role in farming. In terms of decision making, often responsibilities were shared but final decisions were the responsibility of the male head of household:

'Men in this family make decisions with their wife's advice but the man is the main decision maker according to his economic status.' [3]

'Women do 50% work of cultivation but unfortunately women don't share in the decisions and men make decisions about what to grow on the land.' [6]

On decisions regarding food storage, purchase and food distribution at mealtimes, both men and women were involved, and often decisions were shared. Commonly it was said:

'Men and women make decisions together.' [1]

'Men and women control, but men are the main decision makers... We can say it's a kind of group work, for example women give ideas about food to purchase and men purchase them from bazaar, according to their finances and the distribution of the food is done by the women, who make the food.' [6]

In other households, decision making was more strictly defined:

'The mother of the family makes decisions about how to store products according to production and accessibility of the food.' [3]

'Food production is the men's job and household caring is the woman's job.' [11]

Age was also cited as a factor in exercising decision-making power over household food storage and distribution:

'Elders mostly make the decisions but decisions are made in collectively; mostly the grandmother in consultation with the men, and food distribution is up to women, especially the grandmother.' [1]

'Elder men and women jointly make decisions.' [14]

The gender roles within some households were more distinctive:

'Men do not allow women to participate in outdoor activities, and although they are allowed to go to the bazaar, they rarely do.' [11]

5.8 Communal operations

The ongoing sense of community was evidenced by responses about arduous and time-bound activities shared between households, activities that have a more explicit social value, and those like transportation that can be made more efficient through exploiting scale economies:

'People harvest wheat and potato together, which continues for one or two weeks.' [8]

'For harvest they call others to help and for bringing fertiliser from the bazaar.' [1]

'For harvest all the village works together. For bringing fertiliser and food from the bazaar, villagers also get together.' [2]

'There are collective activities for potato production and monthly transportation for bringing their needs from the bazaar, and also for fuelwood collection they hire animals twice per year.' [4]

'Collective activities take place when harvesting products like potatoes and wheat, which are done in one or two weeks once a year during harvest season, and also when purchasing food, all the villagers go to the bazaar together.' [5]

'People work together at the time of the harvest and people rent a car together in order to purchase fertiliser or food from the market.' [10]

'During Eid, all villagers get together and purchase a cow or sheep to be shared with all the families.' [7]

'In Moharram people share consumption of livestock.' [11]

There is evidence that communal operations are reducing in importance:

'In the past, around 10 years ago, there were a lot more communal works like fuel collecting, harvesting, buying food from the bazaar, but nowadays, mostly fuel collecting and harvesting is done by individual households.' [11]

5.9 Produce sales

For engaging with the market, most households gained information about food availability and demand for agricultural sales from visits to the market, and from friends and neighbours. As noted, potato is a relatively new crop, produced for sale as well as consumption. Harvest took place in September (*sonbula-mizaan*) and for one household [2] totalled 1800 kg. Sales were made later, in *aqrab*, or in the mid-winter period 5 or 6 months later. Sheep sales were made in August (*asad-sonbula*).

Poor logistics affected the mode of agricultural sales, such that most households preferred to avoid the costs of transport and sell crops and livestock in the village to local traders:

'People do not need to go to market; they sell their crops to their village traders. They do not need to bring their crops to the bazaar.' [1]

However, some households were acutely aware that making sales locally incurred a significant price penalty. Sales of produce were often made in the village, at a price estimated to be half that received from traders in the bazaar. The same respondent as above commented that remote households were at an economic disadvantage:

'Because of the remoteness to the market, people sell their product two times cheaper than its real price, to local village traders.' [1]

6. Conclusions

6.1 Livelihoods in central Afghanistan

Although the sample of cases was small, the household data elicited have provided a wealth of insights into the seasonality of diets and the sustainability of rural livelihoods in the robust conditions of central Afghanistan, and in particular into food consumption patterns and nutritional vulnerability among the predominantly rural population. Previously, the extreme seasonality in terms of temperature and precipitation, due to altitude as well as other geographical and ecological variables, has been well recorded. How seasonality affects livelihoods is also easily understood in general terms. In any year, extreme temperatures restrict the crop- and forage-growing season to half the year or less. Food and feed for people and livestock alike become restricted. Fuelwood and water are scarce during the long winter. Household maintenance activities, such as collection of fuel and water, become arduous, even dangerous to an extent.

This research offers new insights. The precise impacts of seasonality on household livelihood and nutrition strategies have not been well documented hitherto, and we provide important new data and interpretations of nutrition and livelihoods in a challenging environment. In this final section, we make some general observations about livelihoods in the Shah Foladi region which are likely to have much in common with the central and northern neighbouring provinces such as Daikundi and also the mountainous north-east such as Badakhshan. However, it is noteworthy that households are inherently heterogeneous in structure, status and strategy in managing their common environment.

A deeper analysis would be necessary to quantify the difference in livelihood assets, including landholdings and access to irrigation. This research focuses on the call for context-specific knowledge of food consumption (Gillespie et al.2019).

In summary, we report the following key points:

- Beginning with the national food culture, with its strong dependence on starchy staples, nutritional sufficiency is seriously inadequate in the Shah Foladi region. A period of hunger was reported by most households, and a lack of dietary diversity during much of the year is likely to cause micronutrient malnutrition, especially for the vulnerable groups of children, adolescent girls and women.
- The high level of dependence of the households interviewed on own-production for household nutrition is noteworthy. Land, irrigation and agricultural inputs are important factors of food production but household strategies also involve access to urban food markets, informal seasonal finance for production and consumption, paid casual labour as well as substantive employment in trade.
- Food insufficiency is evidently critical during the lean season. However, we have also noted that the lean season does not occur at a fixed period of the calendar, but is to an extent a phenomenon of natural ecology, production systems and household socioeconomics. People are likely to become malnourished at different times and for different reasons.
- Food storage — grains and potato — is fundamental but finite. For some households, hunger persists into the new growing season with potentially debilitating effects as labour demands increase. But hunger and micronutrient malnutrition are neither co-terminous nor necessarily contemporaneous. The monotonous starchy diet of bread, potatoes and tea is relieved by seasonal access to nutrient-rich foods such as fruits, vegetable and dairy products which become available through household production and markets even while hunger — or energy insufficiency — persists.
- The potential impacts on infants and children of a predominantly starchy diet for extended periods of their development are particularly worrisome and presumably contribute to the high levels of stunting recorded in national survey data. The scale of negative impacts on vulnerable groups will, as noted, depend on household composition.
- In addition to income, saving and borrowing matter for all household expenses, but are essential strategies for easing the constraints on consumption and enabling purchase of productive inputs. Sales of agricultural produce such as potato, grains and livestock occur at different times and ease consumption constraints as well as enabling debt repayments. Further study is needed of financial flows and, in particular, the tendency towards indebtedness.
- Physical remoteness, poor infrastructure and extreme weather hinder access to markets for products, food, labour and finance. Provision of, and access to, basic public services such as health and education limit individual and household well-being, opportunities and potential in the short-, medium- and long-term.

6.2 Natural and political constraints

Within the natural environment, in terms of long-term trends, agriculture and livestock production are threatened by the likely impacts of climate change, which include more extreme temperatures,

erratic precipitation, and increasing likelihood of disasters such as landslides (FAO et al. 2018; Lloyd Simon et al. 2018). One particular danger of major relevance to the problem of agriculture and nutrition in Afghanistan is overgrazing.

In the human environment, sustained economic growth, improved security, and efficient and effective delivery of public services such as health and education are necessary for improved livelihoods. Specific and appropriately formulated interventions through better agriculture and nutrition policies are also necessary (Poole et al. 2018).

6.3 Innovation

The fundamental resilience and skills of the Afghan people are not in doubt. The development of the potato economy has had a dramatic impact on production systems and livelihoods. Such innovation is necessary, but the extent of mono-cropping also presents disease and market risks. In the future, and as the external environment evolves, more change is needed. Researchers in the natural sciences need to scan, explore and invest in potential food system innovations for improved nutrition (Glover and Poole 2019; Shankar et al. 2019). Varieties of grains and other rain-fed crops must be adapted to more erratic precipitation and higher temperatures. In the longer term, irrigated cropping innovations need to optimise water consumption as the currently abundant snowmelt becomes less reliable.

Alongside rangeland management and conservation, and besides alfalfa, more fodder crops are needed that are both productive in harsh conditions and can be stored to improve animal nutrition during the winter and thus increase the productivity of the livestock sector. The cultural affinity to livestock, and the potential dietary contribution of animal-sourced foods (ASFs) to combatting child stunting make sustainable livestock development a priority (Headey et al. 2018). Production innovations must be accompanied by improved processing, marketing and investment (Poole 2018). Improved technologies for food processing and storage, together with protection for nutritious crops at the margins of the growing season, can reduce the period of micronutrient insufficiency. Protected production of vegetables is already used on a small scale. Also a recent project has demonstrated not only the feasibility of an intervention combining agricultural training and input support to adolescent girls in the provinces of Kabul, Parwan and Kapisa, but has also highlighted the value of multi-sectoral interventions linking horticulture, gender, education and nutrition (Alim and Hossain 2018).

Vegetables and other crops can help to combat common micronutrient deficiencies. For example, *cucurbitaceae* potentially offer both culinary variety and nutritional value to diets. While watermelon is already an important seasonal crop, other cucurbits are rich in minerals including β -carotene, the vitamin A precursor. They can be stored and may serve to buffer consumption through — or at least into — the lean season. The production and storage characteristics of pulses suggest that dietary and economic improvements and risk management generally could be derived from wider agricultural production diversity. Expansion of fruit tree production and agro-forestry likewise could reduce vulnerability to seasonality and shocks.

A penultimate comment is that technical solutions have to be sought for local conditions. Therefore, the current reliance on a single ‘innovation’ such as the potato economy is both undesirable and

infeasible for a number of reasons. Territorial and climate-sensitive innovation is needed, and must not be conditioned by the 'requirement' for pan-territorial upscaling, which is unlikely to address the specificities of local conditions (Poole 2017).

Lastly, as and when Afghanistan becomes more stable and prosperous, public investment is required for infrastructure, energy and communication technologies that will permit the development of viable agribusiness and markets. Recent LANSAs research has highlighted the importance of understanding the drivers of the 'enabling environment' for improving the agri-nutrition environment (Gillespie et al. 2019). Here we see that seasonality is hugely significant for food production and consumption, but also for the operation of other markets and driving factors. Hence, what is needed is a systematic and multi-sectoral approach rather than isolated sectoral efforts to agriculture and nutrition. There needs to be a range of indicators that embrace the natural and social environment, particularly gender issues in production, markets and consumption (Poole 2018). Currently, policy coherence in Afghanistan is weak (Poole et al. 2018), and nutrition is not high on the list of effective political commitments.

Above all, only political solutions to the prevailing and worsening insecurity can offer hope that sustainable improvement can be made in nutrition-sensitive agricultural development.

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