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The development and application of a sustainable diets framework for policy analysis: A case study of Nepal

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ABSTRACT

The objectives of this study were to 1) develop a policy analysis framework for examining the components of a sustainable diet and 2) to apply its use to three relevant national polices in Nepal. We developed a policy analysis framework using existing literature and applied the framework to three Nepalese policies: Nepal's Multisectoral Nutrition Plan (MSNP) 2013–2017, Agricultural Development Strategy (ADS) 2015–2035 and National Biodiversity Strategy and Action Plan (NBSAP) 2014–2020. Each policy was coded independently by two researchers to examine whether the different components of the sustainable diets framework were mentioned and if they had associated policy actions. We then used a health policy analysis tool to examine the overall quality of each policy. The ADS mentioned the most (89%) components of the sustainable diets framework as compared to the NBSAP (58%) and the MSNP (70%). If all three policies were fully implemented they would address all but one of the components of a sustainable diet, with the potential to deliver for health and the environment. However, there was a lack of clarity regarding how the resources to accomplish the policy objectives would be obtained as well as insufficient detail regarding the policies' monitoring and evaluation frameworks. The sustainable diets framework developed in this study enables the identification of gaps where policies need to broaden their focus in order to incorporate a more holistic view of the food system. This will become increasingly important as climate change continues to persist and the need for more resilient food systems becomes more recognized.

1. Introduction

In the past several years, we have begun to better understand the impacts of our global food system on human and planetary health (Whitmee et al., 2015). One of the greatest challenges that humanity faces is how to secure healthy, nutritious and safe food to feed an ever-growing population who are getting wealthier and demanding more diverse and sophisticated foods. We are witnessing unprecedented shifts in populations, which impact the way food is grown, purchased and consumed (Ehrlich and Harte, 2015). Not only are we undergoing demographical and epidemiological shifts, but also nutritional status shifts, with increasing urbanization which often coincides with increased obesity and non-communicable disease (NCD) risks due to sedentary lifestyles, complex food environments and unhealthy eating patterns (Anand et al., 2015; Popkin et al., 2012). At the same time, undernutrition continues to persist in many countries.

With the Sustainable Development Goals (SDGs), there is a growing emphasis on the need to ensure that our food systems and diets are more sustainable. We know that what we eat and the way in which we produce food has profound impacts on carbon, water and ecosystem footprints (Tilman and Clark, 2014; Tilman et al., 2011; Downs and Fanzo, 2015). The concept of "sustainable diets" underlines the need to improve the quality and environmental sustainability of the diet (Johnston et al., 2014). Although a healthy diet is not necessarily sustainable (e.g., a product of unsustainable agricultural practices), a sustainable diet is by definition also a healthy diet (Burlingame and Dernini, 2012).

In recent years, there has been a growing interest in the sustainability of the diets that we currently consume and those that we are projected to consume in the future (Tilman and Clark, 2014; Perignon et al., 2017). Research in this domain has largely focused on examining greenhouse gas (GHG) emissions of diets (Perignon et al., 2017) and has found diets lower in energy and in animal

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sourced foods to have the lowest carbon footprint (Tilman and Clark, 2014; Garnett, 2014; Aleksandrowicz et al., 2016; Jones, 2016). However, many of the broader components of sustainable diets are underrepresented in the literature (Perignon et al., 2017). The concept of sustainable diets implies assessing the environmental concerns together with health, nutrient adequacy as well as the affordability and cultural acceptability of diets (Garnett, 2014). By examining the various different dimensions of sustainability it is possible to identify trade-offs and synergies among the different dimensions of sustainable diets. We need to delineate what constitutes a sustainable diet from environmental, biological, cultural and health standpoints, at the global, regional, local and individual levels (Johnston et al., 2014). While frameworks and methodologies to assess and quantify the broad concept of sustainable diets have been proposed (Gustafson et al., 2016; Donini et al., 2016; Dernini et al., 2013) the "sustainability" aspects of diets remains elusive and undefined at the country level, where much of the necessary policy will need to be developed.

Including the concepts of sustainable diets in national policies has the potential to set the stage for policy action. However, the complex web of determinants of sustainable diets makes it challenging for policymakers to understand their benefits and what type of policy actions would be necessary to promote them. More and better data need to be generated alongside improved indicators to assess the impact of the various determinants of the sustainability of a diet and the trade-offs associated with any recommendations aimed at increasing the sustainability of our food system and, ultimately, human health (Johnston et al., 2014; Auestad and Fulgoni, 2015).

Nepal is a small, landlocked South Asian country, that is not immune to dietary shifts, changing demographics and risks to productive, healthy food systems. Consumption (i.e., use of goods and services) and income levels have increased remarkably in the last decade and poverty rates have declined dramatically (GoN, 2011; IFPRI/GNR, 2015). Even with its high rate of poverty reduction due to a number of factors including urbanization and increased remittance income from out-migration, Nepal still suffers with high levels of malnutrition, food insecurity and poverty on the global scale (Population Division Ministry of Health and Population, 2012). At the same time, the country is also beginning to experience the consequences of the nutrition transition – overweight and obesity rates among women increased from 1.6 to 10.1% between 1996 and 2006 and from 19% in 2010 to 21% by 2014 (WHO, 2015; Vaidya et al., 2010; Balarajan and Villamor, 2009). Moreover, food consumption patterns have shifted towards high-value food items such as refined rice, fruits and vegetables, livestock and fishery products which has improved diet diversity and nutritional outcomes, (IFPRI, 2010). Although rapidly changing consumption patterns have improved nutritional outcomes in Nepal, there has also been a simultaneous shift to potentially unhealthy dietary patterns. On average, Nepalese households are consuming ten times the amount of sugar-sweetened snacks (16 g/month to 137 g) as they did 10 years ago and. oil/ghee consumption has increased by 50% (Government of Nepal, 2013).

The Nepalese economy is fundamentally agrarian and profit generated through its agriculture contributes to approximately one third of Gross Domestic Product (GDP) and is the largest source of informal employment to the Nepalese people. Without inclusive development of the agriculture sector in an agrarian-dominated economy such as Nepal's, it is unlikely the country can achieve its goals of poverty reduction, improved food and nutrition security and sustainable development (Bezemer and Headey, 2008). The relatively stagnant performance of Nepal's agricultural sector is largely due to poor crop yields and post-harvest losses caused by the country's susceptibility to man-made and natural disasters, severe climate changes, limited land/production resources, and low agricultural input usage. Man-made and natural disasters that limit agricultural output in Nepal include monsoons, flash floods, erosion and drought. And as witnessed in 2015, Nepal suffers from catastrophic earthquakes which are devastating to populations not only in terms of mortality and morbidity but also by cutting off populations living in the hill and mountainous regions of Nepal, ramping up massive food insecurity and negatively impacting livelihoods.

Nepal is committed to improving nutrition and has recently demonstrated this commitment with the drafting of a Multi-Sectoral Nutrition Plan (MSNP) (Government of Nepal, 2012) and an Agriculture Development Strategy (ADS) (Government of Nepal, 2015) with a Food and Nutrition Security Plan of Action (FNSP) embedded within its core cross-cutting mandate. In recognition that all aspects of human wellbeing depend on ecosystem services, which themselves depend on biodiversity, (WHO, 2015) Nepal has also developed a National Biodiversity Strategy and Action Plan (NBSAP) (Government of Nepal, 2014). Thus, the objectives of this study were to (1) develop a policy analysis framework for examining the components of a sustainable diet and (2) to apply its use to three relevant national polices in Nepal: nutrition (MSNP 2013–2017), agriculture (ADS 2015–2035) and biodiversity (NBSAP 2014–2020).

2. Materials & methods

2.1. Development of sustainable diets framework

We developed a policy analysis framework to examine the various components of a sustainable diet. The framework was designed to encompass all the different dimensions of sustainable diets with the view to applying the framework to identify gaps in policies where dimensions of sustainable diets were missing or required strengthening. Given that policies set the stage for action, recognizing the different components of sustainable diets in policies may be the first step towards obtaining buy-in for actions at the programmatic level that address the dimensions of sustainable diets. By getting sustainable diets on the government agenda, with budgetary allocations, there is a greater likelihood that there will be resources aimed at addressing its various components.

In order to identify the different components to be included in the framework, we conducted a literature review of both peer reviewed and grey literature that included a definition of the different components of a sustainable diet. In particular, the framework included components of sustainable diets described by Garnett (2014), Burlingame and Dernini (2012), Johnston et al. (2014) and Donini et al. (2016). After compiling all the different components of the definition of sustainable diets described in the literature examined, we adapted and combined the constructs to ensure clarity and reduce overlap. We also added additional constructs that we deemed missing from the literature examined. These constructs were subsequently organized based on five domains: (1) nutrition and health; (2) agriculture and food security; (3) environment and ecosystems; (4) markets, trade and value chains for economic growth; and (5) sociocultural and political factors. The development of the framework was iterative – the constructs were adapted and refined throughout the policy analysis process. This was to ensure that all authors were conceptualizing the constructs in the same way and coding policies accordingly. In order to do this, SMD and AP conducted a preliminary coding of policy documents independently whist identifying areas where there was a lack of clarity in the sustainable diets constructs. All three authors then discussed discrepancies in the conceptualizing of constructs together as a group and subsequently refined them based on their discussion. During this stage of the framework development process no qualitative software was used.

In addition to examining the way in which policies addressed the different components of a sustainable diet, we examined the overall quality of the policies. In order to achieve this we combined the sustainable diets framework with a health policy analysis tool developed by Cheung et al. (2010) to assess the strengths and limitations of the policies. The tool was originally based on a framework developed by Rütten et al. (2003) which used specific criteria to examine the alignment between policy statements and the policy's intended outcomes. This tool was subsequently adapted by Cheung et al. (2010) to analyze policy documents.

We used the adapted tool to appraise the extent to which policy statements aligned with intended outcomes in the three Nepalese policies. More specifically we assessed the policies' accessibility, background, goals, resources, monitoring and evaluation, public opportunities and obligations. We then examined the extent to which the policies addressed the different criteria: whether it was fulfilled (yes), partially addressed (somewhat) or missing or weak (no). For example, if a policy did not include any details about the budget (i.e., it excluded line item costs) it would be marked as missing or weak, if it included a budget but did not provide tangible information about where the money to cover the item would come from it would be described as partially addressed, and if it provided ample information about the budget and the funds to cover the budget it was described as fulfilled.

2.2. Application of the framework

We applied both the sustainable diets framework as well as the health policy analysis tool to the key agriculture, nutrition and environmental policies in Nepal (See Box 1). NVivo (version 10) was used to deductively code each policy, with the key words and descriptors serving to determine which sustainable diets components were addressed by each policy. This ensured that the coding process was inclusive and encompassed a broad spectrum of alternative wording used to describe these components. Two independent researchers (SD and AP) examined whether the policies mentioned the different constructs of a sustainable diet. If the policies mentioned the construct but did not include any "action" items it was depicted in a grey circle. If the policy included the construct as part of its key actions or outcomes it was marked in a white circle. Those constructs that were not mentioned in the policies were depicted in a black circle. After completing the checklist for each policy, both researchers (SMD and AP) compared scoring and discussed any discrepancies. In the event that the two researchers did not come to an agreement on the rating a third researcher (JF) served as the arbitrator.

Box 1 The key Nepalese policies examined using the sustainable diets framework.

Multisectoral Nutrition Plan (MSNP) 2013–2017: The overarching goal of the MSNP is to improve maternal and child nutrition by strengthening capacity of the National Planning Commission and key ministries "to promote and steer the multi-sector nutrition program for improved maternal and child nutrition at all levels of society." (Government of Nepal, 2012)

Agricultural Development Strategy (ADS) 2015–2035: The overall aim of the ADS is to move Nepal towards "a self-reliant, sustainable, competitive, and inclusive agricultural sector that drives economic growth and contributes to improved livelihoods and food and nutrition security leading to food sovereignty." (Government of Nepal, 2015)

National Biodiversity Strategy and Action Plan (NBSAP) 2014–2020: The vision of the NBSAP is to support "conservation of biodiversity for sound and resilient ecosystems and national prosperity". More specifically, it aims to enhance the integrity of ecological systems, contributing to human health and sustainable development (Government of Nepal, 2014).

3. Results

3.1. Sustainable diets framework

Fig. 1 depicts the sustainable diets framework developed in this study. The framework consists of 53 constructs representing the key components of a sustainable diet organized within five domains. The majority of the constructs included in the framework were based on the existing literature; however, we added an additional fifteen constructs to the framework (e.g., food safety, air pollution, rural and urban migration, etc.). Table 1 provides a list of the key words and descriptions of the different components of the sustainable diets framework. The key words were used as a guide to assist in coding the policies to each of the components of the framework.

3.2. Application of sustainable diets framework

Table 2 provides an overview of the degree to which each of the three policies addressed the different constructs of the sustainable diets framework. Overall, the ADS was the most comprehensive of all the policies. It addressed 48 of the 53 constructs (89%) within the 5 domains – 67% (36 of 53) of these were actionable with programs or policy actions directly linked to the construct. The NBSAP was the weakest of the three policies in terms of sustainable diets, addressing only 32 of the 53 constructs (58%), 30% of which were actionable. The MSNP addressed 37 of the 53 (70%) sustainable diet constructs; however, only 24 (45%) were actionable.

There were clear gaps in terms of the extent to which policies addressed the different components of a sustainable diet. Fig. 2 depicts the overall percentage of constructs within each of the domains of a sustainable diet that were mentioned and Fig. 3 depicts those that were actionable for each of the three policies. The NBSAP policy did not have any actionable constructs under the health and nutrition domain. Moreover, there were large gaps in terms of actionable constructs for both the NBSAP (30% actionable) and MSNP (20% actionable) policies within the markets, trade and value chains, and gaps for all policies in the sociocultural and political factors, domain ranging from 18% in the NBSAP to 55% in the ADS. The ADS had the highest percentage of actionable constructs within most of the domains with the exception of environment and ecosystems and nutrition and health outcomes where the NBSAP (75% actionable) and MSNP (56%), respectively, had the highest percentage of actionable constructs.

Taken as a collective, the three policies addressed all but one of the 53 sustainable diet constructs – food waste was the only construct not mentioned by any of the policies. Twenty of the constructs were mentioned by all 3 plans, and 47 were mentioned by at least 2 plans. Furthermore, the majority of the constructs (87%) were tied to specific program or policy actions in at least one of the policies. Of these, 25 constructs were addressed actively by at least two policies.

3.3. Health policy analysis tool

Table 3 provides an overview of the strength and limitations of the different policies using the health policy tool. Overall, the three policies were strong; however, there was a lack of clarity regarding how the resources to accomplish the policy objectives would be

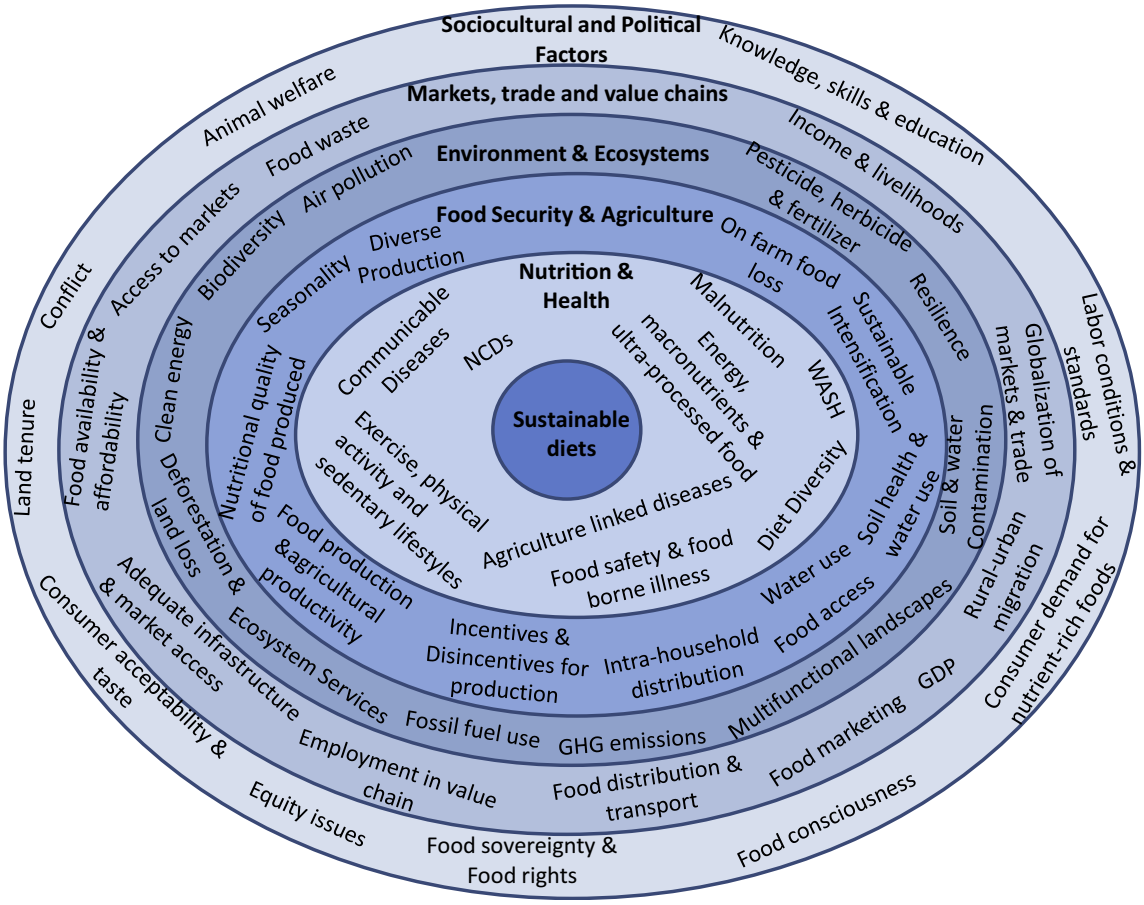

Fig. 1. An overview of the sustainable diets framework.

Table 1
An overview of the sustainable diets policy analysis framework.

Domains	Key components of a sustainable diet	Keywords/Description of concepts	References
Health and Nutrition	Communicable Disease Burden of Population	Infectious disease, parasitic infections, bacterial infections	Johnston et al. (2014)
	Dietary Diversity	Diet quality, nutrient adequacy of diet	Donini et al. (2016); Johnston et al. (2014)
	Exercise, Physical Activity or Sedentary Lifestyles	Physical fitness	Johnston et al. (2014); Donini et al. (2016)
	Food Safety and Foodborne Illness or Contamination	Adulteration, sanitation, food handling, overuse of antibiotics	Added by authors
	Health Influence of Agriculture and diseases linked to chemicals and pesticide use	Infectious diseases, zoonotic, vector borne	Garnett (2014)
	Malnutrition (in all forms)	Stunting (and related cognitive development), undernutrition, underweight, overweight, obesity, wasting, double burden, micronutrient deficiency	Garnett (2014); Donini et al. (2016)
	Non-communicable Disease Burden of the Population	Cardiovascular disease, diabetes, stroke, asthma, allergies, chronic disease, diet-related disease	Johnston et al. (2014); Donini et al. (2016)
	Energy, macronutrients and ultra-processed foods consumed	Fat, sugar, calories, junk food	Johnston et al. (2014); Garnett (2014); Donini et al. (2016)
	Sanitation and Hygiene	Hand washing, open defecation, access to clean water	Garnett (2014)
Food Security and agriculture	Diverse Production Systems	Gardens, community farms, intercropping, crop diversity	Johnston et al. (2014)
	Food access and Food security	Food assistance, food poverty, social safety nets, cash transfer, food aid	Garnett (2014); Donini et al. (2016); Burlingame and Dernini (2012)
	Food Production and Agricultural Productivity	Quantity of food produced, yield	Johnston et al. (2014)
	Incentives or Disincentives for Production	Subsidies, fiscal policy, technology adoption, extension	Added by authors
	Intra-household distribution of food	Allocation of food within the household	Donini et al. (2016)
	Nutritional Quality of Food Being Produced	Nutrient-rich foods, Nutrient-dense	Added by authors
	On Farm Food Loss	Post harvest loss, loss during harvest	Donini et al. (2016)

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Table 1 (*continued*)

Domains	Key components of a sustainable diet	Keywords/Description of concepts	References
	Seasonality, Local and Indigenous Crops	Traditional crops, wild foods, seasonality, indigenous	Donini et al. (2016); Burlingame and Dernini (2012); Johnston et al. (2014)
	Soil Health and Fertility	Soil nutrient management, nutrient cycling, organic matter, composting	Johnston et al. (2014)
	Sustainable Agriculture and Intensification	Climate smart agriculture, IPM, precision agriculture, good agricultural practices	Added by authors
	Water use for agricultural production	Draining of reserves, irrigation, rain water collection, waste water use, catchment systems	Johnston et al. (2014); Garnett (2014)
	Air Pollution and Quality	Cooking fuel exhaust, smoke	Added by authors
	Biodiversity	Extinction, endangerment, overfishing, invasive species, monocultures, exploitation, landraces	Garnett (2014); Donini et al. (2016); Burlingame and Dernini (2012); Johnston et al. (2014)
Environment and Ecosystems	Clean Energy and Green or Sustainable Technologies	Hydropower, solar energy, fuel-efficient technologies, renewable energy sources, biofuels (including from animal waste)	Added by authors
	Deforestation, Wetland and Agricultural Land Loss	Conservation, land use conversion, degradation, alteration of natural habitats	Added by authors
	Ecosystem Services (including Fish Stocks & Marine ecosystem)	Management of natural resources	Johnston et al. (2014); Garnett (2014)
	Fossil fuel use (Cultivation, Processing & Transport)	Coal, charcoal, solid cooking fuel use	Johnston et al. (2014)
	GHG emissions	CO_2, CH4, nitrous oxide, chlorofluorocarbons	Johnston et al. (2014); Donini et al. (2016); Garnett (2014)
	Multi-functional Landscapes	Landscapes that simultaneously provide food security, livelihood opportunities, maintenance of species and ecological functions	Added by authors
	Pesticide, Herbicide and Fertilizer Use	Agricultural inputs, chemical fertilizer, bio/organic fertilizer	Garnett (2014); Donini et al. (2016)
	Resilience	Climate change, climate variability, extreme weather, natural disasters, floods, droughts	Garnett (2014)
	Soil contamination, loss and degradation	Erosion, salinity	Johnston et al. (2014)
	Water contamination and quality	Chemical/agricultural run-off, salinity	Added by authors
Markets, trade and value chains	Adequate Infrastructure and Access to Markets	Distance to markets, market infrastructure, legal access, formal markets, transport costs to market, roads, storage, cold chain storage	Garnett (2014)
	Food availability and affordability	Food prices, food environment	Garnett (2014); Johnston et al. (2014)
	Employment in value chain	Food processing, food service, food retail	Added by authors
	Food Distribution and Transport	Food miles (from farm to plate)	Johnston et al. (2014)
	Food marketing	Advertising, food packaging, food promotion, media outreach, social marketing	Donini et al. (2016); Johnston et al. (2014)
	Food waste	Food loss, food discard	Donini et al. (2016)
	Gross Domestic Product (GDP)	Economic productivity, economic growth, Agricultural GDP	Garnett (2014)
	Globalization of markets/trade	Imports, exports, foreign direct investment, international markets, trade agreements, investment agreements, commercialization, trade deficit	Johnston et al. (2014)
	Incomes and livelihoods	Subsistence farming, poverty alleviation	Johnston et al. (2014)
	Rural-urban migration	Urbanization, agricultural transition, abandonment of farmlands	Added by authors
Sociocultural and political	Animal welfare	Animal poaching, animal rearing, confined-animal feeding operation, animal husbandry	Garnett (2014)
	Food consciousness	Trends and general awareness of how various diet affects health issues and environmental issues	Added by authors
	Conflict	War, fragile states, violence, instability, humanitarian crisis	Added by authors
	Consumer acceptability and taste	Convenience, preferences	Garnett (2014)
	Increased consumer demand for nutrient-rich and diversified foods	Demand for animal products, foods rich in micronutrients, processed and ready made foods, diversity of food products	Added by authors
	Equity Issues	Vulnerable populations, gender, at risk populations, low socioeconomic groups, minority groups	Johnston et al. (2014); Burlingame and Dernini (2012)
	Food Sovereignty and Food Rights	Right to food, farmer rights, control/ ownership of food system, food sufficiency	Donini et al. (2016)
	Food knowledge, skills, and education	Cooking, food preparation, training, recipes, nutrition knowledge, nutrition/health literacy	Garnett (2014); Johnston et al. (2014)
	Labor Conditions and Standards	Workers rights, labor shortage, workload	Garnett (2014)
	Land tenure	Land grabbing, land ownership, land use planning, zoning	Added by authors

obtained as well as insufficient detail regarding the policies' monitoring and evaluation frameworks. While the ADS had a strong budget that detailed specific program costs and a breakdown of their budgets, the allocation of funds and sources of funding were less clear in both the NBSAP and MSNP. For example, the NBSAP policy indicated that 15% of their overall budget would come from funds committed by the Government of Nepal; however, it was not clear whether it would be possible to obtain the remainder of the funds required through alternative sources (e.g., non-governmental organization contributions). Moreover, although all of the policies mentioned the need for improved organizational and human capacity in order to achieve the goals of the policy, it was not clear whether it would be possible to increase this capacity within the budget constraints. Nevertheless, overall the ADS and

Table 2
The extent to which Nepal's agriculture, biodiversity and nutrition policies addressed the different components of a sustainable diet.

Domains	Key components of a healthy and sustainable diet	Agricultural Development Strategy	National Biodiversity Strategy and Action Plan	Multisectoral Nutrition Plan
Health and Nutrition	Communicable Disease Burden of Population	●	●	○
	Dietary Diversity	◉	◉	○
	Exercise, Physical Activity or Sedentary Lifestyles	◉	●	●
	Food Safety and Foodborne Illness or Contamination	○	●	◉
	Health Influence of Agriculture and Diseases linked to chemicals and pesticide use	○	◉	●
	Malnutrition (in all forms)	○	●	○
	Non-communicable Disease Burden of the Population	◉	●	◉
	Energy, macronutrients and ultra-processed foods consumed	◉	◉	○
	Sanitation and hygiene	○	●	○
Food Safety and Agriculture	Diverse Production Systems	○	◉	○
	Food Access and Food Security	○	○	○
	Food Production and Agricultural Productivity	○	◉	○
	Incentives or Disincentives for Production	○	◉	◉
	Intra-household distribution of Food	●	●	○
	Nutritional Quality of Food Being Produced	○	◉	○
	On Farm Food Loss	○	●	○
	Seasonality, Local, and Indigenous Crops	○	◉	○
	Soil Health and Fertility	○	◉	◉
	Sustainable Agriculture and Intensification	○	○	●
	Water Use for agricultural production	○	○	○

Domains	Key components of a healthy and sustainable diet	Agricultural Development Strategy	National Biodiversity Strategy and Action Plan	Multisectoral Nutrition Plan
Environment and Ecosystems	Air Pollution and Quality	●	◉	○
	Biodiversity	○	○	●
	Clean Energy and Green or Sustainable Technologies	○	○	○
	Deforestation, Wetland and Agricultural Land Loss	○	○	●
	Ecosystem Services (including Fish Stocks & Marine ecosystem)	◉	○	●
	Fossil Fuel Use (Cultivation, Processing, and Transport)	●	◉	◉
	GHG Emissions	◉	○	●
	Multi-functional Landscapes	○	◉	◉
	Pesticide, Herbicide and Fertilizer Use	○	○	○
	Resilience	○	○	●
	Soil contamination, loss and degradation	○	○	◉
	Water contamination and quality	◉	○	○
Markets, trade and value chains	Adequate Infrastructure and Access to Markets	○	○	◉
	Food availability and affordability	○	●	◉
	Employment in value chain	○	○	●
	Food Distribution and Transport	○	●	◉
	Food Marketing	○	●	○
	Food Waste	●	●	●
	GDP	○	◉	◉
	Globalization of markets/trade	○	●	●
	Incomes and livelihoods	○	○	○
	Rural-urban migration	○	◉	●

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Table 2 (*continued*)

Domains	Key components of a healthy and sustainable diet	Agricultural Development Strategy	National Biodiversity Strategy and Action Plan	Multisectoral Nutrition Plan
Sociocultural and Political	Animal welfare	○	●	■
	Food consciousness	●	●	■
	Conflict	●	●	●
	Consumer acceptability and taste	●	■	■
	Increased consumer demand for nutrient-rich and diversified foods	●	■	○
	Equity Issues	○	○	○
	Food Sovereignty and Food Rights	○	○	■
	Food knowledge, skills, and education	○	■	○
	Labor Conditions and Standards	○	●	○
	Land tenure	○	●	○
	Socio-cultural Influence on diet: Religion, Gender, Class and Status	●	■	○

Key: The color of each circle signals whether policies mentioned the construct. A white circle indicates the policy included the construct as part of its key actions or outcomes. A gray circle indicates the policy mentioned the construct but did not include any "action" items associated with it. A black circle indicates the policy did not mention the construct.

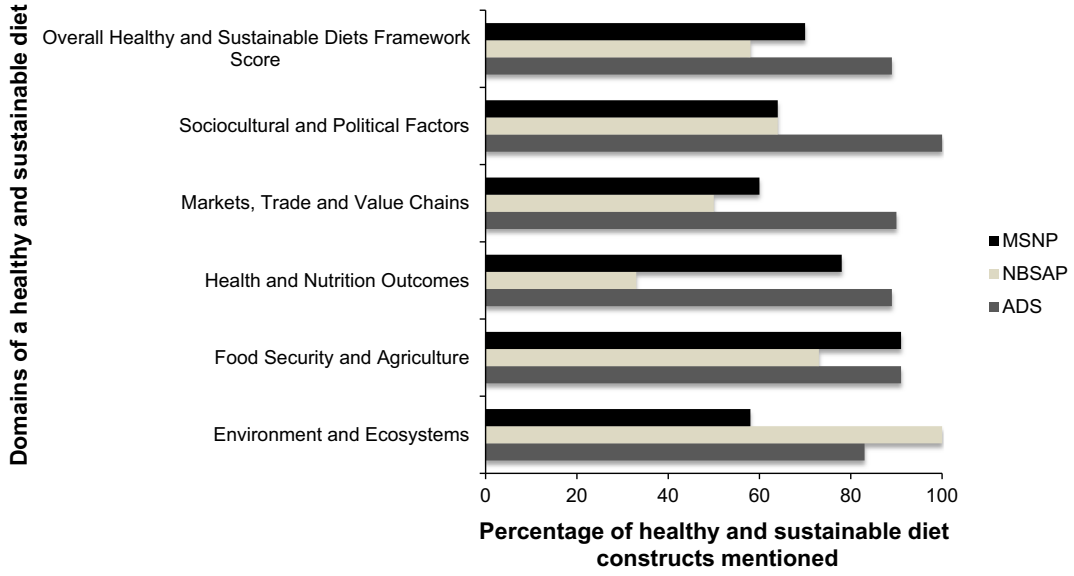

Fig. 2. The percentage of constructs that were mentioned across the different domains of a sustainable diet in Nepal's agriculture, biodiversity and nutrition policies. MSNP = Multisectoral Nutrition Plan NBSAP: National Biodiversity Strategy and Action Plan ADS: Agricultural Development Strategy.

the MSNP were fairly strong policies. The NBSAP performed the weakest of all the policies across the health policy analysis tool. Although the policy's goals were specified, the mechanisms for achieving them remained unclear.

3.4. Coordination of policies

Overall, there was a limited amount of coordination among the three policies. Both the ADS and MSNP mentioned the need to coordinate with one another; however, there was less coordination regarding the NBSAP policy. The ADS directly referred to the MSNP, recognizing that one of the major purviews of the ADS is to support nutrition and food security, and that it must be connected with health related policies and ministries to do so. The MSNP mentioned the Ministry of Agricultural Development as one of the main partners in delivering nutrition related services and discussed the necessity of their involvement to support nutrition activities. The ADS connected in a weaker manner to the NBSAP. While it referenced the need to 'develop biodiversity conservation and climate change adaptation and mitigation through... [the] implementation of the National Biodiversity and Action Plan" it did not delve into the details regarding how that would be accomplished. Moreover, the NBSAP referenced the need for the ADS to support its policy goals but no specific links were delineated to connect the NBSAP and any of the agricultural policies or plans.

4. Discussion

Much like the SDGs, the different components of sustainable diets cross various sectors and fall under the responsibility of many

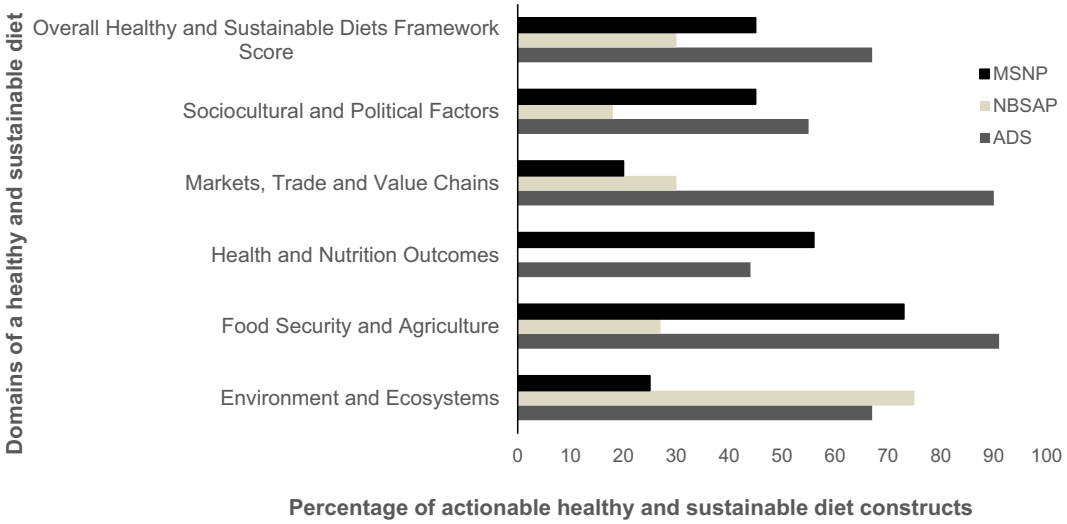

Fig. 3. The percentage of actionable constructs across the different domains of a sustainable diet in Nepal's agriculture, biodiversity and nutrition policies. MSNP = Multisectoral Nutrition Plan NBSAP: National Biodiversity Strategy and Action Plan ADS: Agricultural Development Strategy.

Table 3
An overview of the strength of the agriculture, biodiversity and nutrition policies based on a policy analysis tool developed by Cheung et al. (2010).

Criteria	Definition	Agricultural Development Strategy	National Biodiversity Strategy and Action Plan	Multisectoral Nutrition Plan
Accessibility	The policy is accessible (hard copy and online)	Yes	Yes	Yes
Policy Background	The scientific grounds are established	Yes	Yes	Yes
	The goals are drawn from the literature	Yes	Yes	Yes
	The source of the policy is explicit	Yes	Yes	Yes
	The policy encompasses some set of feasible alternatives	No	No	No
Goals	The goals are explicitly stated	Yes	Yes	Yes
	The goals are concrete enough to be evaluated	Yes	Somewhat	Yes
	The goal is clear in its intent and in the mechanism with which to achieve the desired goals	Yes	Somewhat	Yes
	The action centers on improving the health of the population [or sustainability]	Yes	Yes	Yes
Resources	There are sufficient financial resources	Yes	Somewhat	Somewhat
	There is enough personnel (human resources)	Somewhat	Somewhat	Somewhat
	Organization capacity is addressed	Yes	Somewhat	Somewhat
Monitoring and Evaluation	The policy indicated monitoring and evaluation mechanisms	Yes	Yes	Yes
	The policy nominated a committee or independent body to perform the evaluation	Yes	Yes	Somewhat
	The outcome measures are identified for each of the explicit and implicit objectives	Yes	Yes	Yes
	The data for the evaluation will be collected before, during and after the introduction of the policy	Yes	Somewhat	Yes
	Follow up takes place after a sufficient period to allow the effects of policy change to become evidence	Somewhat	Somewhat	Somewhat
	Other factors that could have produced the change (other than the policy) identified	No	No	Yes
	Criteria for evaluation are adequate or clear	Yes	Yes	Yes
Public Opportunities	Multiple stakeholders are involved	Yes	Yes	Yes
	Primary concerns of stakeholders are recognized and acknowledged to obtain long term support	Yes	Yes	Yes
Obligations	The obligations of the various implementers are specified (who has to do what?)	Yes	Yes	Yes

Yes = the concept was adequately addressed in the policy (i.e., fulfilled).
Somewhat = the concept was partially addressed in the policy (i.e., partially addressed).
No = the concept was missing or very weak in the policy (i.e., missing or weak).

ministries. The very nature of sustainable diets is multisectoral and requires cooperation across government ministries, departments and programs. Making progress to address the challenges faced by the food system will require ministries to work together and for individual sectoral policies to address the food system as a whole. We found that Nepal's agricultural policy was very comprehensive and addressed the majority of the components of a sustainable diet, while the Biodiversity and MNSP addressed fewer.

Overall, the three policies combined addressed all but one component of the sustainable diets framework. Although the policies were overall fairly strong, there was a lack of clarity surrounding whether there would be sufficient resources and capacity to carry out the policies' objectives and whether the monitoring and evaluation frameworks were sufficient to measure the impact of the policies on agricultural, nutrition and environmental outcomes.

4.1. Sustainable diets addressed in Nepal's policies

Having a policy environment that promotes and supports the different components of a sustainable diet would likely increase the uptake of on the ground activities and programs that lead to a more resilient food system. Taken as a whole, the three policies examined in Nepal – if fully implemented – would lay the foundation needed to accomplish this; however, better coordination among the policies will be needed. The ADS policy, reviewed individually, was very comprehensive. Future biodiversity and nutrition policies should also strive to more holistically address the different domains of a sustainable diet. This will be increasingly important as climate variability, and associated natural disasters, continue to increase. Climate change is an increasingly threatening issue for Nepal – the country is in the top 20 most disaster-prone countries in the world (Dangal, 2011) and is the 4th most vulnerable country to climate change (UNDP, 2014). It ranks 11th and 30th in terms relative vulnerability to earthquakes and floods and landslides, respectively, with droughts, forest fires, and flooding projected to increase dramatically in coming years (Government of Nepal, 2013). Ensuring that policies and programs are proactive in terms of climate change mitigation and adaptation will be increasingly important moving forward. These new realities will need to be considered by all policies in nearly all ministries and government departments. This will require a shift away from siloed policies and programs – improved coordination at both the national and local level will be needed.

In addition to the environmental changes that make it imperative for Nepal to adopt policies that address the various components of a sustainable diet, changes to the food environment will also need to be considered in terms of both policy development but also future nutrition programing at the local level. Although the main focus of Nepal's policies to date has been on undernutrition, future policies will need to take a broader view of malnutrition and more thoroughly address diet-related NCDs. Ensuring that agricultural, nutrition and environmental policies support the production and consumption of culturally appropriate foods that support the reduction of all forms of malnutrition and diet-related disease as well as promotes planetary health will be necessary moving forward in Nepal.

4.2. Overall quality of policies

Examining the overall quality of the policies analyzed using the sustainable diets framework was an important part of the policy analysis process. Countries can develop excellent policies but if they are not implemented they are unlikely to have an impact. Moreover, if their monitoring and evaluation plans are inadequate it will make it difficult to assess their impact. Monitoring and evaluation is an important part of the policy cycle given that it feeds into the development of future policies and programs by identifying what is working and what requires additional attention and resources. Although the policies examined were overall of good quality, they lacked clarity in terms of resources and capacity as well as their monitoring and evaluation plans. Many policies are plagued with a lack of capacity for implementation. This is not something that is unique to Nepal. There is a growing recognition globally that capacity needs to be increased in terms of scaling up nutrition efforts in developing countries (Fanzo et al., 2015; Shrimpton et al., 2016; Sunguya et al., 2014). This also points to the need to go beyond analyzing policy documents but to also examine the implementation of these policies. Conducting fieldwork to examine sustainable diet concepts on the ground would help to inform how future policies could be strengthened to better support more resilient food systems. Although there has recently been some work done to try to develop a set of metrics for measuring sustainable diets (Gustafson et al., 2016; Donini et al., 2016; Dernini et al., 2013) little research has been conducted to actually apply these to a specific country setting. Using a combination of policy analysis and primary data collection to assess sustainable diets on the ground may help to provide insight into the most appropriate ways to try reorient local food systems towards the production and consumption of healthy and sustainably produced foods and where policies might be the most effective in supporting those activities.

4.2.1. The applicability of the sustainable diets framework

The sustainable diets framework developed as part of this study is intended to be applicable to a variety of policy documents and to different country contexts in order to identify the gaps in terms of addressing the different components of sustainable diets. Given the more recent interest in incorporating aspects of sustainability into dietary guidelines (Gonzalez Fischer and Garnett, 2016) there is scope to apply the framework to dietary guidelines across different countries to examine aspects of sustainable diets that are missing from current guidelines with the view to trying to address gaps in future versions. There is often a disconnect between what is produced, and how it is produced, and recommendation both in terms of sustainability and dietary intakes. By applying the framework to dietary guidelines but also agricultural policies, incongruence between production and what is recommended for consumption can be identified and subsequently addressed. This is aligned with the recommendations from the 2nd International Conference of Nutrition that indicated that "developing coherent public policies from production to consumption and across relevant sectors" is needed to enhance sustainable food systems (International Conference on Nutrition, 2014).

One of the challenges of developing a framework that can be applied to low-, middle- and high-income countries is that, whilst there is a lot of overlap, there are also different issues that plague developed as compared to developing countries. For example, food waste (after it leaves the farm gate) was not mentioned in any of the policies examined. In Nepal, like most developing countries, food waste occurs at the farmgate (i.e., postharvest losses) rather than at the consumer level (Bond et al., 2013). Thus when applying the framework to different countries, it may need to be adapted to better reflect the country context.

One of the limitations of the framework is that it does not address the extent to which the different policies address the different components of sustainable diets. We tried to overcome this limitation by identifying the components of the framework that had policy actions attached to it and those that did not. One of the challenges faced when examining policies is that they don't always translate into immediate action, or any action at all. This is a limitation of this framework and something that likely requires primary data collection over extended periods of time. Another potential limitation of the framework is that we did not apply any weighting to the different framework components. Although it is likely that some components of a sustainable diet may have a greater impact on agricultural, nutrition and environmental outcomes it is not clear what the most appropriate way to weight these might be. For this reason, we did not applying any weighting to the framework. This has historically been a point of discussion among the broader sustainability community and one that has

not yet reached consensus. In the realm of sustainability there are often trade-offs between improving one aspect of sustainability and negatively impacting another and our framework does not include a mechanism for assessing those trade-offs. It is likely that trade-offs will have to be assessed on an individual basis and will require a thorough analysis of potential gains and losses from an environmental and health as well as a moral perspective.

4.3. Conclusions

The framework developed as part of this study allows for the analysis of policies to examine the extent to which they address the different components of a sustainable diet. It enables the identification of gaps where policies need to broaden their focus in order to incorporate a more holistic view of the food system. This will become increasingly important as climate change continues to persist and the need for more resilient food systems becomes more recognized. In Nepal, the ADS policy does a good job of addressing the majority of the concepts of a sustainable diet, whereas the nutrition and biodiversity policies have clear gaps.

Future research needs to examine local food systems to better understand the extent to which they are healthy and sustainable. By combining multisectoral policy analyses with fieldwork, using metrics, models and indicators, it will enable the identification of points for policy or program actions to better support sustainable food systems and sustainable diets.

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