Food Policy 44 (2014) 36–46

Contents lists available at ScienceDirect

Food Policy

journal homepage: www.elsevier.com/locate/foodpol

Exploring dietary guidelines based on ecological and nutritional values: A comparison of six dietary patterns

C. van Dooren [a,*], Mari Marinussen [b], Hans Blonk [b], Harry Aiking [c], Pier Vellinga [c]

[a] Netherlands Nutrition Centre (Voedingscentrum), P.O. Box 85700, 2508 CK The Hague, The Netherlands
[b] Blonk Consultants, Gravin Beatrixstraat 34, 2805 PJ Gouda, The Netherlands
[c] Institute for Environmental Studies, VU University, De Boelelaan 1087, 1081 HV Amsterdam, The Netherlands

ARTICLE INFO

Article history:
Received 27 February 2013
Received in revised form 29 August 2013
Accepted 4 November 2013

Keywords:
Sustainable diet
Dietary guidelines
Mediterranean diet
Climate change
Land-use
Health score

ABSTRACT

The objective of this study was to explore the synergies between nutritionally healthy and ecologically sustainable diets. The aim was to explore the possibilities for future integrated dietary guidelines that support consumers to make informed dietary choices based on both ecological and nutritional values. We developed a score system for health and sustainability. Subsequently, we tested six different diets: current average Dutch, official 'recommended' Dutch, semi-vegetarian, vegetarian, vegan and Mediterranean. For the sustainability rating, we used the Life Cycle Assessment, measuring the impacts on greenhouse gas emissions (GHG) and land use (LU). For the health rating, we used ten nutritional indicators. By comparing the overall scores we found that the consumption of meat, dairy products, extras, such as snacks, sweets, pastries, and beverages, in that order, are largely responsible for low sustainability scores. Simultaneously, these food groups contribute to low health scores. We developed a matrix that illustrates that the health and sustainability scores of all six diets go largely hand in hand. Fig. 1 provides a visualisation of the position of the six diets in the full health and sustainability spectrum. This matrix with scores can be considered a first step in the development of a tool to measure both sustainability and health issues of specific food patterns. In selecting the diets, we examined two directions: health focus diets and the animal protein reduction diets. The Mediterranean diet is generally the health focus option with a high sustainability score. We conclude that guidelines oriented in between the two directions (i.e., semi- and pesco-vegetarian) are the option with the optimal synergy between health and sustainability.

Introduction

Societal food concerns: health and sustainability

Dietary guidelines issued by governments, health councils, and nutrition institutes are mainly focused on nutrition and health issues in response to upcoming Western, food-related lifestyle diseases. The present study refers to the WHO recommendations (WHO, 2003) for nutritional adequacy and healthy diets. These guidelines, together with national recommendations like the British guidelines (BNF, 2007), the new Dietary Guidelines for Americans (USDA, 2010), and the Dutch Dietary Guidelines (DDG; Health Council, 2006) support consumers to make healthy, informed choices. Such guidelines, however, do not address another major societal concern: the quality of the natural environment and sustainability issues.

Current trends in food production and consumption are considered unsustainable. For example, approximately one-third of human influence on climate change and land use (LU) is related to our diet and the food chain (Dutilh and Kramer, 2000; Tukker et al., 2006; Vringer et al., 2010; Garnett, 2011). This is more than the impacts of leisure, housing or labour. Climate change mitigation policies tend to focus on the energy sector, while the livestock and food sector receives less attention, despite the fact that this sector accounts for 18% of the greenhouse gas (GHG) emissions and 80% of total anthropogenic land use (Stehfest et al., 2009). Land use is the major driver for loss of biodiversity. Although food is a necessity in life, personal diet choice can strongly influence these impacts.

These societal concerns result in a growing interest by policy makers as well as consumers to integrate healthy and environmentally friendly diet recommendations. It is important for governments and institutions to not send conflicting messages to consumers on these issues. Experts have reached a consensus about the notion that *Future dietary guidelines* (are needed) *to be based on ecological (including climatological) as well as nutritional science* (Simopoulos et al., 2011).

* Corresponding author. Tel.: +31 70 306 88 56.
E-mail addresses: dooren@voedingscentrum.nl (C. van Dooren), mari@blonkconsultants.nl (M. Marinussen), hans@blonkconsultants.nl (H. Blonk), harry.aiking@vu.nl (H. Aiking), pier.vellinga@vu.nl (P. Vellinga).

0306-9192/$ - see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.foodpol.2013.11.002

The actual diet is related to consumers' personal food choices and behaviour (Hahn, 1988). Research shows that consumers have little awareness of their diets environmental impact, but many would be open to making more sustainable choices if it were easy to do so. Simpler, more user-friendly information and advice about how to make more sustainable choices is therefore necessary (Davies, 2011). The first stage in most behaviour change models is problem recognition: consumers need a sense of urgency and some awareness (Prochaska and DiClemente, 1983; Weinstein et al., 1998). For awareness, consumers need to have knowledge (information) about the problematic character of current unsustainable consumption patterns and the dramatic consequences that will likely result from these patterns. For a sense of urgency, consumers need to be convinced that a shift towards more sustainable consumption is needed in order to accommodate the increasing world population's needs and to prevent environmental damage (Schwinghammer, 2013).

During the last few decades, awareness about 'planetary health' and 'sustainable' diets has increased (Gussow, 1999). It was in 1986 that Joan Dye Gussow formulated her first dietary guidelines for sustainability (Gussow and Clancy, 1986). More recently, the British (Reddy et al., 2009), Swedish (Livsmedelsverket, 2009), German (Gerlach et al., 2009), Finnish (Steering Group, 2010), and Belgian governments (FRDO, 2011) have put together committees to give policy advice on 'sustainable' diets. A growing body of research suggests that if we are to achieve substantial reductions in food-related GHG emissions, then we will have to address not only how we produce and distribute our food but also what we eat (Garnett, 2011). In 2010, the Dutch Ministry of Economic Affairs, Agriculture and Innovation asked the Health Council *An opinion on the latest state of knowledge in 'Sustainable Food Guidelines' and choice options for the selection of food by consumers.* Our study has been set up to provide scientific input to this opinion. The opinion was published in 2011 (Health Council, 2011).

This study is obviously from the perspective of a developed nation where ample dietary variety, food supplies and nutritional advice are available. It aimed to explore the development of integral, practical, and achievable dietary guidelines, based on synergies between health and sustainability. Different European (Baroni et al., 2006; Risku-Norja et al., 2009) and Dutch studies (Elferink, 2009; Gerbens-Leenes, 2006; Kramer et al., 1999) have already quantified the impact of animal protein reduction scenarios on energy consumption, land use, and greenhouse gas emissions. To date, few studies have systematically combined and quantified both the health and sustainability impacts of different diet options. Meanwhile, consumers call for easier choices based on future dietary guidelines.

Obviously, what makes one diet more sustainable than another diet needs to be defined. A definition was recently agreed upon by the FAO (2010a): *Sustainable Diets are those diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimising natural and human resources.* This definition combines elements of ecological impact and healthy life. Of course sustainable diets will have to be nutritionally adequate. To develop integral nutritional advice, additional insight is needed into the potential effects of different changes in diet on climate impact, land use, and health gains, and the mutual synergies or conflicts between these elements.

In this paper, we start by selecting six diets representative for a broad range of personal diets. Next, we describe the method we used to rate health aspects and sustainability aspects. In the results section, we present the resulting scores, illustrating a number of synergies between health and sustainability. Finally, we analyse the results in terms of food groups and identify the food groups that contribute most to the final scores. The analysis should be considered a first step in the development of guidelines on food in diets that meet consumers' needs regarding both health and sustainability aspects.

Theory: development of methodology

In this section, some potential indicators of diets' sustainability and health gains are evaluated.

Six diet options selected

To explore the different options, we selected six diets. In many publications about sustainable food patterns, in addition to the most highly mentioned reduction of meat consumption, 'vegan' and 'Mediterranean' diets are frequently cited as more sustainable options (Baroni et al., 2006; Burlingame and Dernini, 2011; Marlow et al., 2009). This article will investigate these and other options. Six diets were selected by the authors with the aim to illustrate the effect of a wide range of quantities in consumption of animal products, fruits, vegetables, cereals and energy-dense products. These diets were as follows:

1. VCP 1998 – average Dutch consumption: Best available public source is the Dutch National Food Consumption Survey (VCP) 1998 (TNO, 1998). In 2011, the RIVM (National Institute for Public Health and the Environment) published a new survey, but the survey results were not yet available at the time of the present study.
2. DDG – recommended Dutch Dietary Guidelines (Health Council, 2006): These guidelines consist of a few quantitative recommendations for adults based on nutritional adequacy and health gains as mentioned in Section Indicators and health gain score.
3. Semi-vegetarian (50/50): This diet is an average between diets 2 and 4. This option is selected to incorporate a diet which may serve as a compromise between sustainability and palatability to the general public.
4. Traditional vegetarian (ADA, 2009): There are no Dutch data available on the consumption of meat substitutes by vegetarians. In consultation with experts on vegetarianism (staff members of the Dutch Vegetarians Union), we replaced the weekly meat consumption with the following: 4 eggs, 1 portion of pulses (75 g), 250 g nuts, and 3 portions (300 g) of ready-to-eat meat substitutes, such as tofu.
5. Vegan (ADA, 2009): In the vegan diet, milk is replaced by calcium-enriched soy drinks. Protein products are in line with the vegetarian option, but the eggs are replaced by an extra portion of pulses. Vegetable consumption is increased by 200 g, and the vegetables are rich in calcium.
6. Mediterranean: This is a diet lower in meat, high in fish, fruits, and vegetables, with fewer extras, and plant oils instead of animal fats. An excellent, quantitatively defined description of this diet was published by Fidanza and Alberti (2005). Willett (2001) published together with Oldways in 2009 the Mediterranean Diet Pyramid (www.oldwayspt.org). A consensus meeting recently updated the Mediterranean diet pyramid and gave quantification in servings, but without portion sizes (Bach-Faig et al., 2011).

The diets 2–6 (quantified in Table 1) meet the Dutch Dietary Guidelines (Health Council, 2006). The vegetarian and vegan diets are to a high degree comparable to the vegetarian and vegan adaptations of USDA food patterns (USDA, 2010). The latter differ from the Dutch recommendations of more vegetables and fruit (in con-