



Exploratory Workshop | Sustainable Protein Supply

Friday 16 March 2012

Hotel Casa 400, Amsterdam, The Netherlands

Workshop Booklet

Foreword

The global demand for animal protein (such as meat and milk proteins) is increasing rapidly. This is caused by the growing world population and reinforced by the increasing income per capita in industrializing countries in Asia and South America. For example, in the period 1970-2000 the global consumption of meat increased from about 100 to 235x106 tons. The FAO estimates that the meat consumption will rise to a level of 463 tons in 2050. This increase will of course result in a tremendous growth in need for feed protein, which will be hard to meet in an eco-sustainable way. Globally, the livestock sector is responsible for 18% of anthropogenic greenhouse gas emission measured in CO2 equivalents, accounts for 70% of all agricultural land and for over 8% of global human water usage (FAO report “Livestock’s long shadow”).

Hence, reducing the environmental impact of the global protein consumption is of crucial importance to allow meeting the needs for future generations. Mitigating options to reduce the impact are:

1. Optimise animal protein production with respect to environmental impact (e.g. use of protein sources not suited for human consumption, increase digestive efficiency).
2. Develop alternatives to conventional animal protein containing products (e.g. plant based meat substitutes, insects).
3. Promote a change in eating habits of consumers (e.g. eating less meat, other types of meat).

During the workshop, emphasis will be on options 1 and 2. These options, as well as food politics regarding sustainable protein supply, will be discussed by experts in the fields. Furthermore, the vision of the EU on this topic will be presented. Last but not least, consequences for the European research and innovation agenda will be assessed.

The Organising Committee is convinced that the challenge to supply the required amounts of protein in a sustainable way, taking into account the three central issues regarding sustainability (People, Planet and Profit), can be met. However, in view of the enormous increase in protein need in the coming decades, time is running out. Therefore a research agenda has to be made, that provides a vision and ambition on future supply of sustainable protein in Europe and defines the first steps to be taken to realize its implementation. This is the aim of this workshop. The Organising Committee hopes that the participants will have intensive and fruitful discussions, thereby providing a sound base for preparing research proposals to meet the protein challenge.

Organising Committee:

Prof. Antonella Baldi, University of Milan, IT
Prof. Tiny van Boekel, Wageningen University, NL
Dr Ragni Ofstad, Nofima AS, NO
Dr José Pueyo, ICA, CSIC, ES
Dr Ioanna Stavridou, COST Office, BE
Dr Johan Vereijken, Wageningen University and Research Centre, NL

Programme

Friday 16 March 2012

10:00 – 10:20	Registration and coffee	
10:20 – 10:45	Opening of the workshop	
10:20 – 10:30	José Pueyo	Chair of the COST Domain Committee for Food and Agriculture (FA) / CSIC, Institute of Agricultural Sciences, ES Welcome by COST
10:30 – 10:45	Leo den Hartog	Wageningen University and Director R&D and Quality Affairs, Nutreco, NL Introduction
10:45 – 10:45	Session on animal protein production	
10:45 – 11:15	Henning Steinfeld	Food and Agriculture Organization of the UN, IT Sustainability issues in livestock production
11:15 – 11:45	Ian Givens	Reading University, UK Do we need protein from animal-derived foods in our diet?
11:45 – 12:45	Session on plant protein production	
11:45 – 12:15	Anna Arnoldi	University of Milan, IT Plant proteins: food applications and health benefits
12:15 – 12:45	Anthanasios Krystallis	Aarhus University, DK Production process-differentiation: ethical meat and consumer responses
12:45 – 13:45	Lunch	
13:45 – 14:15	Alternatives	
	Arnold van Huis	Wageningen University, NL Contribution of edible insects to food security
14:15 – 15:15	Session on protein supply	
14:15 – 14:45	Pierre Mathy	European Commission, Directorate-General for Research and Innovation, BE EU Research & Innovation priorities related to protein supply
14:45 – 15:15	Tim Lang	City University London, UK Food politics and sustainability
15:15 – 15:30	Coffee / tea	
15:30 – 16:30	Integrating session	
15:30 – 16:15	Panel discussion	
	Chair: Leo den Hartog	Wageningen University and Director R&D and Quality Affairs, Nutreco, NL
16:15 – 16:30	Ioanna Stavridou	COST Office, BE COST and its activities
16:30 – 16:45	Closing of the workshop	
	Leo den Hartog	Wageningen University and Director R&D and Quality Affairs, Nutreco, NL Wrap-up

Workshop Speakers



Anna Arnoldi

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Biography Anna Arnoldi is Professor of Food Chemistry and Functional Foods at the School of Pharmacy of the University of Milan (Italy), Department of Pharmaceutical Science. She is author of over 150 papers on international journal or books, over 150 oral/poster communications at congresses, and 6 patents. The main research interests are: the health promoting components of grain legumes (soybean, lupin, pea), the development of innovative functional foods for the prevention of cardiovascular disease, the toxicological and sensory consequences of the food processing, the development of innovative methods for food quality assurance based on mass spectrometry and proteomics. She is considered one major expert on lupin proteins worldwide and she will represent Europe in the Steering Committee of the International Food Legume Research Conference-VI (Canada 2014). She is also General Secretary of the Italian Society of Nutraceuticals (SINUT). She has been the coordinator or scientific coordinator of 4 European research projects: Processed Foods, "Optimisation of the Maillard reaction. A way to improve quality and safety of thermally processed food"; Healthy Profood, "Optimised processes for preparing healthy and added value food ingredients from lupin kernels, the European protein-rich grain legume"; Bioprofibre, "Development of cholesterol lowering foods through bioactive proteins and fibres"; Lupicarp, "Innovative functional foods from sweet lupin for cardiovascular prevention". She is also one of the founders of the academic spin-off HPF-Nutraceuticals, whose mission consists in the development of innovative nutraceuticals from legumes.

Abstract **Plant proteins: food applications and health benefits**

The term plant proteins refers mainly to grain legume proteins, since these are the most efficient protein sources among vegetables. The protein content of most legumes (pea, common bean, lentil, chickpea, faba bean, etc.) is around 22-25%, whereas the content of soybean and lupin may reach 35-42% depending on the variety and the environmental and agricultural conditions. Besides proteins, other important nutritional components in legumes are resistant starch, soluble fibers, alpha-galactosides, unsaturated fatty acids (including alpha-linolenic acid) and antioxidant polyphenols, as well as macro and micro-elements and vitamins. Several populations in developing countries base their protein intake mostly on legumes: this is particularly true for women and children. In industrialized countries, the interest for legume protein is also related to their specific biological activity. In fact the outcomes of numerous clinical studies conducted in Europe and the US have demonstrated that consuming soy protein in place of animal proteins has positive effects on the levels of total and LDL cholesterol. In 1999 the U.S. Food and Drug Administration has approved the health claim on soy foods for the prevention of cardiovascular disease. At present, a similar health claim is pending in the European Union. Detailed studies have shown that the proteins have a predominant role in the cholesterol-lowering activity of soy. Since most legume proteins have considerable sequence homology, several groups, including ours, have undertaken studies on these vegetables. The most investigated are bean (a term indicating some species of the genera *Phaseolus* and *Vigna*), pea, faba bean, chickpea and lupin. Numerous experimental studies in different animal models and a few clinical studies are available, which have indicated interesting pharmacological activities, against hypercholesterolemia, hypertension and hyperglycemia. Our attention was mainly focused on lupin whose composition is very similar to soy (high protein content, reduced presence of starch, relatively high concentrations of alpha-linolenic acid). Experimental studies in a rat model of hypercholesterolemia and in a rabbit model of the atherosclerotic plaque, and a double-blind clinical study on moderately hypercholesterolemic patients have shown very promising activities. A clinical study conducted in Australia has shown, instead, a potential hypotensive activity.



Leo den Hartog

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Biography Leo den Hartog graduated in Animal Sciences at Wageningen University, the Netherlands, in 1978, where he also obtained his Ph.D. in 1984 on the relation between nutrition and fertility in gilts and sows. Starting as a researcher at the department of Animal Nutrition at Wageningen University, he was Associate Professor in monogastric nutrition at that same university from 1982-1989. During that period he spent one year as visiting professor at the University of Alberta, Edmonton, Canada. In 1989, he was appointed Director of the Research Institute for Pig Husbandry in Rosmalen, the Netherlands, followed in 1997 by an appointment to Director of the Research Institute for Animal Husbandry in Lelystad, the Netherlands.

In 2001, Leo den Hartog became Director of R&D at Nutreco and part-time professor 'Farm management in Animal Production' at Wageningen University. Within Nutreco he became responsible for Quality Affairs in 2006 and additionally for Corporate Sustainability in 2011.

In 1989 he received the Henneberg Lehmann award from the University of Göttingen in Germany. In 1999 he got an honorary Ph.D. from the University of Kaposvar in Hungary. His broad experience in animal production is reflected in over 450 scientific and applied articles and 7 books as author or co-author. He gave more than 500 lectures in over 35 different countries for e.g. scientists, advisors and farmers. He was 5 times chairman of Dutch trade missions of the ministry of Agriculture, Nature and Food Quality to China, Taiwan, South Korea, Brazil, Argentina, Chile and South Africa.



Ian Givens

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Biography Professor Ian Givens has background training in biochemistry and nutrition and is currently Director of the Food Production and Quality Research Division in the Faculty of Life Sciences, University of Reading. His research interests focus on food chain nutrition with emphasis on the relationship between consumption of animal-derived foods, nutrient supply and chronic disease outcome with particular emphasis on vascular disease and saturated, trans and n-3 fatty acids. This includes the role of animal nutrition to improve the composition of these foods and the need to develop valid markers of chronic disease risk associated with consumption of normal and modified foods. Currently a member of the Executive and Management Committees of the COST Project 'Feed for Health' (<http://www.feedforhealth.org>) looking at effect of animal diet on human and animal health. Some recent publications: Givens, D. I. (2011) Milk in the diet: good or bad for vascular disease? Proceedings of the Nutrition Society DOI: 10.1017/S0029665111003223, Published online: 17 October 2011 Dougkas, A., Reynolds, C.K., Givens, D.I., Elwood, P.C. and Minihane, A.M. (2011). Associations between dairy consumption and body weight: a review of the evidence and underlying mechanisms. *Nutr Res Rev*, 24, 72–95. Rymer C., Hartnell G.F. and Givens D. I. (2011). The effect of feeding modified soyabean oil enriched with C18:4n-3 to broilers on the deposition of n-3 fatty acids in chicken meat. *Br J Nutr*, 105, 866–878. Givens, D. I. (2010) Milk and meat in our diet: good or bad for health? *Animal*. 4:1941-1952. Elwood, P. C., Pickering, J. E., Givens, D. I., and Gallacher, J.E. (2010). The consumption of milk and dairy foods and the incidence of vascular disease and diabetes: An overview of the evidence. *Lipids*, 45:925-939. Givens, D. I. and Gibbs, R. A. (2008). Current intakes of EPA and DHA in European populations and the potential of animal-derived foods to increase them. *Proc Nutr Soc*, 67: 273-280.

Abstract **Do we need protein from animal-derived foods in our diet?**

Foods derived from animals are an important source of nutrients in the diet. Notably they provide protein of high quality and some of the proteins have functionality beyond simply being a source of essential amino acids. Examples of this include blood pressure lowering bioactive peptides from milk proteins and the role of whey proteins in maintaining muscle mass in the elderly. There is however uncertainty about whether or not animal-derived foods contribute to increased risk of various chronic diseases and whether their production damages the environment. For milk, data from long-term prospective cohort studies provides convincing evidence that increased consumption of milk can lead to reductions in the risk of vascular disease and possibly some cancers although the relative effect of milk products is unclear. Accordingly, simply reducing milk consumption in order to reduce saturated fatty acid intake is not likely to produce benefits overall. For red meat there is no evidence of increased risk of vascular diseases though processed meat appears to increase risk substantially. There is still conflicting and inconsistent evidence on the relationship between consumption of red meat and the development of colo-rectal cancer but this topic should not be ignored. Likewise the role of poultry meat and its products as sources of dietary fat and fatty acids is not fully clear. There is concern about the likely increase in the prevalence of dementia and but there are few data on the possible benefits or risks from milk and meat consumption. Overall the case for increased milk consumption seems convincing although the case for high fat dairy products and red meat is not. Processed meat products do seem to have negative effects on long term health and although more research is required, these effects do need to be put into the context of other risk factors to long term health such as obesity, smoking and alcohol consumption.



Athanasios Krystallis

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Biography	<p>Dr. Athanasios Krystallis is Associate Professor at the Department of Business Administration, School of Business and Social Sciences, Aarhus University, and co-responsible for consumer research at the MAPP Centre. Athanasios has an MSc degree in food marketing and a PhD in consumer behaviour (both from the University of Newcastle upon Tyne, UK). His scientific interests focus on consumer behaviour with emphasis on perceived intrinsic and extrinsic food quality and food safety and their implications on marketing strategy of various food product categories, including organic, traditional/local foods, functional foods etc. His expertise also includes the statistical modeling of food consumer behavior in the above-described issues (food quality and safety management), as well as the evaluation of market performance of quality-related product attributes in terms their customer loyalty generation potential. Athanasios has participated in more than 15 research projects in the last 5 years, 6 of which have been funded by the EU under FPs 5, 6 and 7. His inclusive work comprises 50 international peer reviewed publications, in ISI journals such as European Journal of Marketing, Journal of Marketing Communications, Journal of Business Research, Journal of Marketing Management, Journal of Product and Brand Management, Food Quality and Preference, Appetite, Risk Analysis, Health Risk and Society, British Food Journal, Agribusiness etc. His publications also include 10 books and book chapters and numerous papers and abstracts published in international conference proceedings.</p>

Abstract **Production process-differentiation: ethical meat and consumer responses**

Animal production enterprises are facing progressive increase in meat demand in emerging markets (i.e. BRIC countries), and more fragmented demand in mature (i.e. Western) markets. To respond to those two parallel trends, product differentiation, process- or product-based, is needed. Production process-differentiation characteristics could be represented by ethical (i.e. sustainable) farming practices. Ethical meat production appears to have great market potential, especially when constant and reliable signalling and information is given to consumers. However, current market realities indicate small market shares of ethical meat, despite academic evidence suggesting positive consumer attitudes towards sustainable meat production practices. This controversy points towards the existence of a gap between citizens' attitudes and consumer behaviour. This presentation thus aims to offer insights to respond to the following central question: is informed consumer choice an option for bridging the attitudes-behavior gap and promoting ethically produced meat? And, is ethical labeling a viable and convincing communication alternative? Aiming at stimulating relevant dialogue, this presentation will attempt to contribute to the creation of a relevant research agenda. Ideally, this agenda should also incorporate questions that deal with the issue of consumer acceptance and how to communicate perceived benefits of ethical/sustainable meat to consumers in a trustworthy and convincing way. Ethical signaling (i.e. labels) should be able to meaningfully summarise the information conveyed, as consumers tend not to pay attention to detailed/technical information. However, only if certification bodies establish reputation in the markets will the corresponding labels be accepted as quality surrogates. Moreover, consumers appear willing to pay for ethical labels, yet this should be expected to differ per consumers' demographics, beliefs & attitudes, as well as per meat product and production process types. Consequently, the issue of ethical meat production from a consumer perspective requires a targeted strategic approach. Above all, ethical meat should "deliver" its value (i.e. hedonic, nutritional, social) to consumers as any other meat or food type, incorporating intrinsic qualities that would justify superior experienced quality; only then, ethical process-based extrinsic quality cues (i.e. sustainable labels) will be able to fully deploy their market dynamism.



Tim Lang

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Biography Tim Lang has been Professor of Food Policy at City University's Centre for Food Policy since 2002. He was a hill farmer in Lancashire in the 1970s and for the last 35 years has engaged in public and academic research and debate about food's impact on health, environment, social justice and consumers. He was Commissioner on the UK Government's Sustainable Development Commission (2006-11) and a member of the Council of Food Policy Advisors. He's co-author of Food Policy (Oxford University Press, 2009), the Atlas of Food (2nd ed Earthscan, 2008), Food Wars (Earthscan, 2004). His new book, with G Rayner is Ecological Public Health (Earthscan-Routledge), published in April 2012.

Abstract **Food politics and sustainability**

There is now wide agreement, since the 2006-08 food price spike that a new food world order is emerging. The new fundamentals are complex: environmental (soil, water, climate, land use, biodiversity, etc.); economic (resource allocation, labour, prices), public health (nutrients, access, eco-nutrition) and societal (diet, choice, affordability, availability). This paper suggests that the policy frameworks for this 'new food order' are not yet in place although there are some useful starting points. At the EU level, the Common Agricultural Policy is primarily still a farm policy not an integrated food policy. Public health thinking is still information focussed. The Single Market has not been able to incorporate consumer advice on sustainable diets (the case of Sweden). The most useful policy direction is Sustainable Consumption and Production (SCP). At national member state level, important attempts to promote behaviour change (e.g. over obesity) are narrowly based on information and appeals to rational choice. In supply chains, the question of sustainability is too often viewed as de-carbonisation primarily if at all. This situation is thus a mismatch between evidence, policy and practice. Within academic discourse, however, there is growing agreement that new policy thinking is required to build EU, member state and local 'rooms for manoeuvre'. I suggest that sustainable food supply – including protein but also of other nutrients – requires policy reorientation by state, supply chain, civil society and professions. Consumer change is essential. But sustainability is being marginalised by the fiscal crisis, which is altering food markets, changing consumer behaviour and re- shaping cultural tastes, altering price signals differently. The paper concludes that the debates about sustainable protein are another illustration of how technical change ultimately has to be integrated into societal and supply chain change. It must be adopted not imposed. Clear leadership is sorely needed.



José Pueyo

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Biography Dr. José J. Pueyo (Zaragoza, Spain, 1962) is Chair of COST Domain Committee on Food and Agriculture. He is currently the leader of a research group at the Institute of Agricultural Sciences, belonging to the Spanish National Research Council (CSIC) in Madrid, Spain. His main interests include the biotechnological improvement of legume crops and the study of beneficial plant-microbe interactions. He is author of more than sixty scientific publications and one patent in the fields of Biotechnology, Applied Microbiology, Plant and Soil Sciences, Forestry and Agronomy. Dr. Pueyo obtained his Ph.D. from the University of Zaragoza, Spain in 1990, and worked as a Postdoctoral Research Assistant at University College Dublin, Ireland (1991). He was then awarded a Postdoctoral Fulbright Fellowship and joined the University of California, San Diego, CA, USA. Subsequently, he moved to The Scripps Research Institute, La Jolla, CA, USA as Research Associate. In 1997 he obtained a CSIC tenured position as group leader at the Centre for Environmental Sciences/Institute for Natural Resources, where he was appointed Director in 2005 until 2010. He also held a position from 2003 as External Advisor for International Cooperation at the Spanish Ministry of Science and Innovation and served as Scientific Manager of the Ministry's open calls for International Cooperation Actions between 2006 and 2008. He was nominated National Delegate for Priority Food Quality and Safety in Framework Programme VI (2003-2006). Thereafter, he was appointed Vice-Chair of CYTED (the Latin-American Programme on Cooperation in Science and Technology) Committee on Sustainable Development and Global Change (2006-2009). In parallel, he was nominated Spanish Delegate for COST Domain Committee on Food and Agriculture in 2006. He was elected Chair of this Domain Committee in 2008 and re-elected in 2010.



Henning Steinfeld

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- Biography Henning Steinfeld is an agricultural economist working at the Food and Agriculture Organization (FAO) as head of the Livestock Information, Sector Analysis and Policy Branch.
- Abstract **Sustainability issues in livestock production**
Growing population and incomes continue to fuel a growing demand for animal protein. Typically, the production of animal products has higher resource requirements than that of vegetal protein. The talk will explore the current resource claims of the livestock sector, and its contribution to global and local environmental issues. The focus is on potential efficiency gains in livestock production that could help to accommodate demand growth within the context of finite resources.



Arnold van Huis

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Biography Prof.Dr.Ir. Arnold van Huis worked from 1974 to 1979 in Nicaragua for the Food and Agriculture Organization of the United Nations (FAO) on integrated pest management (IPM) in foodgrains. From 1982 to 1985 he coordinated from Niger a regional crop protection training project for eight Sahelian countries. From 1985 onwards he works as tropical entomologist at Wageningen University, the Netherlands, and has been responsible for a number of IPM and biological control projects in the tropics. He worked with FAO on developing strategies to control the Desert Locust in Africa, the Middle East and Southeast Asia. He currently coordinates an interdisciplinary project in West Africa entitled "Convergence of Sciences: strengthening innovation systems in Benin, Ghana and Mali" (9 PhD students, 9 postdocs and 100 collaborators from the North and the South). He supervised about 100 MSc and 18 PhD theses, and currently supervises 6 PhD students. He published about 200 papers of which half refereed. He coordinates a project in the Netherlands called "Sustainable Production of Insect Proteins". He serves as a consultant to FAO on insects as a food source for humans and livestock. He formulated for the UN organization a global policy on the "Potential of Insects as Food and Feed in assuring Food Security".

Abstract **Contribution of edible insects to food security**

The increase in consumer demand for animal proteins, for example in emerging economies, highlights the urgent need to identify alternative protein sources. Since 1970, world meat consumption has increased almost three-fold, and is expected to double again between 2010 and 2050. However, at the present time 70% of agricultural land is used for livestock production. With an increase in the world population, increased consumer demand for protein, and the amount of available agricultural land being constrained, the sustainable production of food and feed will represent a serious challenge for the future. We need new agricultural technologies and new patterns of food consumption, based on healthier and more sustainable diets. So, the need for alternative protein sources (other than "meat" from livestock) is urgent. The production of insects as protein sources has great potential in contributing to global food security by providing a sustainable basis for protein production, through exploiting the ideal compatibility of economics and ecology. Promoting edible insects may mitigate the livestock crises. However, if no action is undertaken this food habit will soon disappear. More than 1800 species of insects are eaten worldwide, mainly in developing countries. Edible insects constitute high quality food for humans, livestock, poultry and fish. Because insects are cold blooded, they have a high food conversion rate. Besides, they emit less greenhouse gases and ammonia than conventional livestock. In some cases insects can be grown on organic waste reducing environmental contamination. Therefore, edible insects are a serious alternative for conventional production or other animal based protein sources, either for direct human consumption, or indirectly as feedstock. In the developing world, a re-evaluation of the food resource is required, while in the western world processing technology needs to be developed in order to make it an acceptable food item.

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About COST

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