



Portrait of the National Research Programme (NRP 69)

# Healthy Nutrition and Sustainable Food Production



SWISS NATIONAL SCIENCE FOUNDATION

**What is an NRP?**

National Research Programmes (NRP) provide scientifically substantiated solutions to urgent problems of national significance. They are approved by the Federal Council, last from 4 to 5 years and are funded with CHF 5 to 20 million. NRPs are problem-oriented; inter- and transdisciplinary; dedicated to achieving a defined, overall goal through coordination of individual research projects and groups and focused on the knowledge transfer of the results.

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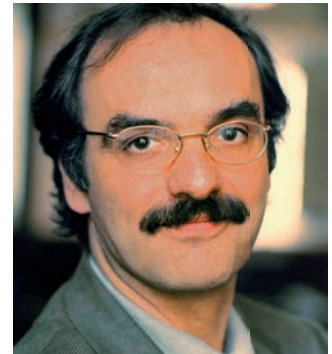
# Exploring the link between health and food

**The National Research Programme “Healthy Nutrition and Sustainable Food Production” (NRP 69) explores the link between the predominant diseases of our time and nutrition. Its objective is to remove barriers in food, medical and agricultural research to improve food systems as a whole.**

Diet-related diseases account for a third of healthcare expenditure in Switzerland, or CHF 20 billion per year. These figures of the Federal Office of Public Health (FOPH) provide a basis for assessing the importance of the theme of nutrition in the area of public health policy. The chronic diseases which are predominant these days are quite different from the infectious and deficiency-related diseases which were more widespread in the time of our grandparents

or great-grandparents. Our diet has changed considerably since those days, as have the diseases around us. The link between disease and diet is still very strong, however. We now need to integrate this link more effectively into our research.

We must transform our food systems so that they bring health improvements for all. But that's not the end of the story. We also need to reinvent the way we produce food so that there is less wast-



**Prof Fred Paccaud**  
President of the NRP 69  
Steering Committee

age of resources such as water or soil, so that the environment is respected and so that prices remain affordable. This is the double challenge of the National Research Programme “Healthy Nutrition and Sustainable Food Production” (NRP 69). It must adopt a transdisciplinary approach to make food systems better.

Nutrition is a cross-cutting theme which is just starting to be treated as such by research. Anything that is changed in the pork production chain has an impact on consumer health; the economic models of retail trade or of the agri-food industry have an influence on public health; the agricultural policy of a State has repercussions on the health of the population, as does its environmental policy.

What kind of contribution can the research conducted within the scope of NRP 69 be expected to make? Maybe

we will work out how consumers can be persuaded to make better food choices, even though we know that most people are well aware of what they should and shouldn't eat. Maybe we will contribute to the development of new products in the area of functional food or in the field of food supplements. Maybe we will discover ways of making dairy farms more economically efficient and at the same time more respectful to the environment. Maybe we will succeed in modelling food systems and in identifying their weaknesses in a more precise manner.

**Promoting health and protecting the environment: the double challenge of NRP 69.**

We need to give the 21 research groups time. One thing that is already

certain, however, is that NRP 69 needs to contribute to removing the barriers between agricultural, food and medical research. Considerable effort to achieve consensus will also be required on completion of the research. The Federal Council, the Federal Office of Agriculture, the Federal Office of Public Health and the Cantons are expecting clear recommendations to help them decide whether it is necessary to adapt the food-related legislation, prevention policy, agricultural policy or environmental policy.

A solid basis for decision-making is important not only for the political authorities but also for the many players involved in food systems. Farmers, the agri-food industry, the retail trade, restaurants, consumer organisations, doctors and nutritionists are among the main stakeholders concerned by this

programme and they will be involved at a very early stage. It will be necessary to work together with them to identify the inevitable goal conflicts that will arise and to seek compromises supported by a majority.





## Twenty-one research projects, three questions, one programme

**The National Research Programme “Healthy Nutrition and Sustainable Food Production” (NRP 69) brings together 21 research groups from various disciplines. The scientists will focus on three main areas to explore the link between sustainable food systems and public health.**

The Federal Council launched the National Research Programme “Healthy Nutrition and Sustainable Food Production” (NRP 69) on 30 March 2011. This programme brings together disciplines such as the life sciences, nanoscience, food science, epidemiology, medicine, engineering, agricultural science and humanities and social sciences. It has a budget of thirteen million Swiss francs.

The objective of NRP 69 is to improve food systems to increase the benefits of food to public health and to make food production more sustainable, particularly with regard to the use of resources. Recent research indicates that the relationship between the sustainability of food systems and the effect of these systems on public health does indeed warrant further investigation.



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In a nutshell, the aim is to answer three questions:

- **How can the people of Switzerland be encouraged to eat healthily?**
- **How can products that are healthy and fit for consumption be made available at affordable prices?**
- **How can the production, processing and distribution of food be managed effectively with the least possible impact on the environment?**

On 16 July 2013, the Steering Committee of NRP 69 selected 21 research projects. Many focus on just one of the three programme topics, but some projects cover more than one area. The research teams are multidisciplinary. After an initial research phase of three

years, NRP 69 will have funding available to continue ongoing projects or to launch new ones for an additional two-year period.

Commissioned by the Federal Council, National Research Programmes contribute to the resolution of current problems. NRP 69 has the task of providing the Federal and Cantonal political authorities, large retail and agri-food companies, restaurants, farmers, doctors, nutritionists and consumers with recommendations. These recommendations may take the form of decision-making aids, strategies or scenarios for planning into the future. But NRP 69 could also lead to innovations – in terms of processes, services or products.

# Overview

## Key Questions

- **How can the people of Switzerland be encouraged to eat healthily?**
- ▲ **How can products that are healthy and fit for consumption be made available at affordable prices?**
- **How can the production, processing and distribution of food be managed effectively with the least possible impact on the environment?**

■ **Salt consumption**  
**Sigrid Beer-Borst**  
Institute of Social and Preventive Medicine,  
University of Bern

■ **Preventing obesity**  
**Dr Lukas Emmenegger**  
Laboratory for Air Pollution/Environmental  
Technology, Empa, Dübendorf

■ **Health motivators**  
**Prof Claude Messner**  
Institute for Marketing and Management,  
University of Bern

■ **Vitamin D**  
**Prof Sabine Rohrmann**  
Institute of Social and Preventive Medicine,  
University of Zurich

■ **Food choices**  
**Prof Michael Siegrist**  
Institute for Environmental Decisions,  
ETH Zurich

▲ **Citizen consumer**  
**Prof Jean-Philippe Leresche**  
Science, Politics and Society Observatory,  
University of Lausanne

▲ **Social inequality**  
**Dr Pedro Marques-Vidal**  
Institute of Social and Preventive Medicine,  
University of Lausanne

▲ **Preservative bacteria**  
**Prof Leo Meile**  
Institute of Food, Nutrition and Health,  
ETH Zurich

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- ▲ **Dietary fibres**  
Prof Laura Nyström  
Institute of Food, Nutrition and Health,  
ETH Zurich
  - ▲ **Nano-preservation**  
Prof Cornelia Gabriela Palivan  
Department of Chemistry, University of Basel
  - ▲ **Healthy pigs**  
Prof Peter Spring  
Bern University of Applied Sciences, School of  
Agricultural, Forest and Food Sciences
  - ▲ **Functional Food**  
Dr Andreas Steingötter  
Institute for Biomedical Engineering,  
ETH Zurich
  - ▲ **Staphylococci**  
Prof Roger Stephan  
Institute for Food Safety and Hygiene,  
University of Zurich
  - ▲ **Safe cereals**  
Dr Susanne Vogelgsang  
Agroscope, Institute for Sustainability  
Sciences, Zurich
  - ▲ **Metal exposure**  
Prof Wolfgang Wilcke  
Institute of Geography, University of Bern
  - **Organic food basket**  
Prof Marion Fresia  
Anthropology Institute, University of Neuchâtel
  - **Food losses**  
Dr Gabriele Mack  
Agroscope, Institute for Sustainability  
Sciences, Ettenhausen
  - ▲ ● **Sustainable milk production**  
Dr Pierrick Jan  
Agroscope, Institute for Sustainability  
Sciences, Ettenhausen
  - ▲ ● **Sustainable agri-food systems**  
Dr Birgit Kopainsky  
Flury & Giuliani GmbH, Zurich
  - ▲ ● **Iron and zinc**  
Prof Raffaele Mezzenga  
Institute of Food, Nutrition and Health,  
ETH Zurich
  - ▲ ● **Cow emissions**  
Dr Sabine Schrade  
Agroscope, Institute for Sustainability  
Sciences, Ettenhausen

## The Projects

### ■ Salt consumption Measures to reduce salt consumption among the Swiss working population

High salt intake is a risk factor for cardiovascular disease. This project investigates the effects of various measures for reducing salt consumption. For this purpose, the salt content of the meals offered by staff restaurants of volunteer companies will be reduced gradually, with the kitchen staff and participating employees receiving theoretical and practical information on healthy eating at the same time. The test subjects will undergo regular monitoring of health indicators.

**Sigrid Beer-Borst**  
Institute of Social and Preventive Medicine,  
University of Bern

### ■ Preventing obesity Measurement of fat breakdown and energy balance

The aim of this project is to develop an analyser capable of measuring substances representative of fat metabolism in patients' breath. Based on laser spectroscopy, the instrument will be capable of quantifying the presence of acetone in particular. Acetone is produced when the human body burns fat and uses up more energy than it takes in. Obese patients will be able to assess their energy balance on a daily basis, optimise their treatment and increase their motivation.

**Dr Lukas Emmenegger**  
Laboratory for Air Pollution/Environmental Technology,  
Empa, Dübendorf

## ■ Health motivators

### How the environment can help people to eat more healthily

The influence of knowledge on eating habits is only small. Food choices are shaped more by motives such as enjoyment, the company of others or the social environment. Experiments will be conducted in canteens and in the laboratory and analyses performed to determine which stimuli in the environment influence the eating habits of the test subjects. The study provides new insights into how decisions are made and may therefore help to identify effective measures for a healthier diet.

**Prof Claude Messner**

Institute for Marketing and Management,  
University of Bern

## ■ Vitamin D

### Vitamin D supply and appropriate strategies for improvement

Vitamin D is a nutrient that plays an important role in bone formation and in the prevention of chronic diseases. Deficiencies have an influence on child development even during pregnancy. However, it is unknown what the vitamin D supply looks like in pregnant women. This project examines the influences of skin pigmentation and genetic predisposition on the levels of vitamin D in the blood of pregnant women and their babies and from this derives recommendations for possible improvement strategies.

**Prof Sabine Rohrmann**

Institute of Social and Preventive Medicine,  
University of Zurich

## ■ Food choices

### Influence of knowledge, social setting and environment on eating habits

Eating habits are influenced by a variety of factors. This project involves both developing a new scale for measuring nutritional knowledge and examining the significance of the eating environment in a field experiment. A long-term study in young people will also provide insights into the influence of the social environment on eating habits. The findings from the studies will provide a basis for developing interventions for a more balanced diet and healthier behaviour.

**Prof Michael Siegrist**

Institute for Environmental Decisions,  
ETH Zurich



▲ **Citizen consumer**  
**Consumer participation in decisions regarding sustainable food**

The preferences of responsible “citizen” consumers constitute a key challenge for the economic success and political legitimacy of players involved in the food supply chain and by the State. The challenge is to gain a better understanding of the conditions under which citizen consumers participate in decisions regarding sustainable food and the scope of their participation. The research will focus on the main themes of organic farming, carbon footprint, Swissness and local authority catering.

**Prof Jean-Philippe Leresche**  
Science, Politics and Society Observatory,  
University of Lausanne

▲ **Social inequality**  
**Consequences of socioeconomic differences for diets and healthiness**

Individuals in the most disadvantaged sections of society tend to have worse dietary behaviours than individuals in higher socioeconomic groups. This study aims to examine dietary patterns according to socioeconomic position in the French speaking part of the Swiss population, using objective measurements of individual food intake. This study will assess whether socioeconomic differences contribute to unhealthy behaviour in socially disadvantaged segments of the population.

**Dr Pedro Marques-Vidal**  
Institute of Social and Preventive Medicine,  
University of Lausanne

▲ **Preservative bacteria**  
**Organic food preservation with inhibitory bacteria**

Fermenting microorganisms are often used to preserve food. This process results in products which inhibit moulds and other organisms. There are probably some strains of bacteria that produce inhibitory substances we don't yet know about. The project seeks to use genome sequencing to identify lactobacilli with a high potential for organic preservation. The unique genes and their function will be subjected to further research and their safety assessed by comparison with other bacteria.

**Prof Leo Meile**  
Institute of Food, Nutrition and Health,  
ETH Zurich

▲ **Dietary fibres**  
**Processing beta glucan for enhanced molecular interactions**

The beta glucan contained in the dietary fibres of oats and barley has cholesterol-lowering and blood pressure-regulating properties. It is therefore an effective aid for the control of chronic diseases. Beta glucan molecules are altered during the processing steps involved in food production, however, which can result in a reduction in their beneficial effects on health. New processing techniques will be researched which preserve or even improve the properties of beta glucan.

**Prof Laura Nyström**  
Institute of Food, Nutrition and Health,  
ETH Zurich

### ▲ Nano-preservation Safeguarding food quality with nano-reactors

The aim of the project is to develop nano-reactors which, when placed on food packaging, will be capable of detecting the state of freshness of the packaged food products. The nano-reactors will consist of nanometer size vesicles in which antioxidant molecules such as vitamin C are encapsulated. In the walls of the nano-reactors, membrane proteins will act as gates. They will release the antioxidant as soon as the first signs of a decline in the freshness of the food reach them.

**Prof Cornelia Gabriela Palivan**  
Department of Chemistry,  
University of Basel

### ▲ Healthy pigs Sustainable production of healthy pork meat

The production of pork meat contributes to environmental problems such as global warming or overfertilisation. Livestock farming can also be a source of antibiotic-resistant bacteria. Comparisons in the field indicate that a great potential exists for improvement in the short-term, however. The project identifies market-oriented measures for producing pork meat in a more resource-efficient way and with a lower use of antibiotics while improving meat quality and animal welfare at the same time.

**Prof Peter Spring**  
Bern University of Applied Sciences, School of  
Agricultural, Forest and Food Sciences

### ▲ Functional Food In vivo validation of functional food emulsion systems

The aim of this project is to develop functional foods, which prolong the feeling of fullness after a meal, thus lowering fat intake. The first stage aims at developing appropriate emulsions. In a second stage, the effects of these emulsions on gastrointestinal function and on the mechanisms of hormonal regulation during digestion will be analyzed and investigated. The objective is to exert a positive influence on the eating habits of obese individuals.

**Dr Andreas Steingötter**  
Institute for Biomedical Engineering,  
ETH Zurich



▲ **Staphylococci**  
**Reducing the risk of Staphylococcus-  
induced food poisoning**

The enterotoxins produced by staphylococci are among the primary causes of food poisoning. We still know very little about the production and storage conditions which promote or inhibit the formation of enterotoxins in food. This project examines the role played by these factors in the formation of enterotoxin B. It therefore contributes significantly to reducing the risk of Staphylococcus-induced food poisoning.

**Prof Roger Stephan**  
Institute for Food Safety and Hygiene,  
University of Zurich





### ▲ Safe cereals

#### Protection against *Fusarium* thanks to health-promoting cereal varieties

Certain varieties of wheat, oats and barley contain elevated levels of health promoting compounds. At the same time, they could be more resistant to attack by *Fusarium* fungi which produce harmful toxins. This project examines the factors influencing fungal infection, the epidemiology of the fungi and the role of health promoting compounds as possible resistance factors. The results provide a basis for the development of new cropping strategies and for breeding of more resistant varieties with health promoting properties.

**Dr Susanne Vogelgsang**

Agroscope, Institute for Sustainability Sciences,  
Zurich

### ▲ **Metal exposure**

#### **Analysis of the movement of trace metals to make farming more sustainable**

Swiss soils can contain excessive levels of trace metals, and these can have an adverse effect on the quality and quantity of food produced in the long-term. This project identifies the sources of metals using a new method based on stable isotopes. It also enables conclusions to be drawn regarding the quantities in which metals enter cultivated plants from the soil. The results will provide a basis for drawing up measures for avoiding metal accumulation in soils and plant foods.

**Prof Wolfgang Wilcke**  
Institute of Geography,  
University of Bern

### ● **Organic food basket**

#### **Local contract farming: sustainable production and consumption?**

Local contract farming initiatives rely on a food system based on proximity and incorporating sustainability, solidarity and participation objectives. They offer consumers a supply in the form of a subscription to a lot of local agricultural products, the price, quantity and quality of which are predefined. This project aims to gain a better understanding of how these networks work and their actual impact on the practices of consumers and producers.

**Prof Marion Fresia**  
Anthropology Institute,  
University of Neuchâtel

### ● **Food losses**

#### **Strategies for reducing potato losses in the supply chain**

Around 20 to 40 percent of all potatoes produced in Switzerland are lost for human consumption. The aim is to study the processes of potato production from cultivation and processing to the plate, with particular consideration being given to the question to what extent domestic quality standards contribute to the losses. The knowledge gained will be used to develop strategies to improve the sustainability of potato cultivation, processing and marketing.

**Dr Gabriele Mack**  
Agroscope, Institute for Sustainability Sciences,  
Ettenhausen

### ▲● Sustainable milk production ECON'ENTAL – for more sustainable dairy farms

Dairy farming is the most important sector of Swiss agriculture. An economically viable and environmentally friendly milk production is essential to ensuring a sustainable development of the Swiss food supply chain. However, very little is known about the relationship between the economic and environmental performance of farms. The aim of this project is therefore to improve our understanding of the relationship between these two dimensions of farm sustainable performance, using the example of dairy farms in mountain regions.

**Dr Pierrick Jan**  
Agroscope, Institute for Sustainability Sciences,  
Ettenhausen

### ▲● Sustainable agri-food systems Scenarios and models for a sustainable agri-food system

Population growth, climate change and resource scarcity: these are the key challenges faced by the agri-food system in Switzerland. Many different players are involved and the factors determining a sustainable food provision are complex. This project uses environmental-economic modelling approaches to simulate potential development paths and provides a basis for making decisions regarding the future of the agri-food system in Switzerland.

**Dr Birgit Kopainsky**  
Flury & Giuliani GmbH,  
Zurich

### ▲● Iron and zinc Nanostructured minerals for human nutrition

More than two billion people worldwide are affected by iron and zinc deficiency, which contribute to increased morbidity and mortality. Adding these minerals to food is an effective and sustainable strategy for fighting these deficiencies. However, there are still very few compounds available which offer good bioavailability and which are also effective. This project develops new nanotechnology-based approaches to fortifying food with iron and zinc.

**Prof Raffaele Mezzenga**  
Institute of Food, Nutrition and Health,  
ETH Zurich

▲● **Cow emissions**  
**Reducing ammonia and greenhouse gas emissions in dairy farming**

Dairy farming is responsible for a large proportion of Swiss greenhouse gas and ammonia emissions. In experimental housing, respiration chamber and laboratory studies, this project investigates how these emissions could be reduced by means of structural, process engineering and feeding strategies. Practical reduction measures may contribute to the achievement of climate change objectives and improve the sustainability of milk products at the production stage.

**Dr Sabine Schrade**

Agroscope, Institute for Sustainability Sciences,  
Ettenhausen



# Involving special interest groups from the start

**The transfer of knowledge from NRP 69 is directed at numerous target audiences with an interest in the results of medical, agricultural or food research conducted within the scope of the programme. It will bring together all the stakeholders into a monitoring group to work together in identifying potentially conflicting goals.**

NRP 69 (“Healthy Nutrition and Sustainable Food Production”) will lead to a better understanding of the link that exists between food systems and public health. It will seek to make food production, processing and distribution more sustainable (at the same time as ensuring affordable prices) and to make it possible for a larger proportion of the population to achieve a healthy diet. Finally, it aims to bring agricultural, me-

dical and food research together under its umbrella to tackle the subject of nutrition from a global perspective. Knowledge transfer must promote these three aspects of the NRP throughout the research process.

The transfer of knowledge from NRP 69 will be directed at multiple target audiences. The Federal and Cantonal political authorities that are active in the fields of public health and agri-

culture will be heavily involved in the programme. Another important dialogue group is the food industry, from producers to large distributors, and including processors and restaurants. The media, consumer organisations, doctors and nutritionists constitute other priority target audiences.

NRP 69 will need to provide these groups with recommendations which are understandable and geared to practical requirements. To achieve this, it will make use of a variety of communication tools, including a website, newsletter, seminars, publications, audiovisual materials, conferences and other types of presentation. Media relations will also be an important tool.

NRP 69 will need to take into account potentially conflicting goals between all the players affected by the topic of nutrition – between producers and the agri-

food industry, between agricultural policy and public health policy or between consumers and public health advocates. For this purpose, NRP 69 will set up a monitoring group bringing together, representatives of the main stakeholders concerned. This group will be kept up-to-date with the progress of the scientific teams and will have the task of proposing solutions or compromises in the event of any conflicting goals. The Steering Committee will take this work into consideration when drawing up the final summary of NRP 69.



## Informations



## Management

### Steering Committee Members

**Prof Fred Paccaud**  
Director, Institute of social and preventive medicine, University Hospital Center, Lausanne (president)

**Prof Stefania Boccia**  
Faculty of Medicine, Università Cattolica del Sacro Cuore of Rome, Italy

**Prof Paolo Boffetta**  
Institute for Translational Medicine, Icahn School of Medicine at Mount Sinai, New York, USA

**Dr Alan Dangour**  
Department of Nutrition and Public Health Intervention Research, London School of Hygiene and Tropical Medicine, London, UK

**Prof Lynn Frewer**  
School of Agriculture, Food and Rural development, University of Newcastle, Newcastle, UK

**Prof Dietrich Knorr**  
Department of Food Biotechnology and Food Process Engineering, Berlin Institute of Technology, Berlin, Germany

**Dr Barbara Redlingshöfer**  
Mission d'anticipation Recherche/Société & Développement durable INRA, Paris, France

**Prof Greg Thoma**  
Department of Chemical Engineering, College of Engineering, University of Arkansas, USA

**Prof Bruce Trill**  
School of Agriculture, Policy and Development, University of Reading, Reading, UK





**August 2016**  
End of first  
research phase



**August 2018**  
Completion of  
research work

**Delegate of the National  
Research Council**

**Prof Stefanie Hellweg**  
Institute of Environmental  
Engineering, ETH Zurich

**Representatives of the  
Federal Administration**

**Dr Urs Gantner**  
Head of Research and  
Extension division,  
Federal Office for Agri-  
culture (FOAG)

**Dr Michael Beer**  
Head of Food Safety divi-  
sion, Federal Office of  
Public Health (FOPH)

**Delegate of the Commis-  
sion for Technology and  
Innovation (CTI)**

**Dr Barbara Keller**

**Programme Coordinator**

**Dr Marjory Hunt**  
SNSF, Berne

**Head of Knowledge  
Transfer**

**Xavier Pilloud**  
Bonhage PR AG

### **The Swiss National Science Foundation**

The Swiss National Science Foundation (SNSF) is Switzerland's leading provider of scientific research funding. Commissioned by the federal government, it supports research work in all academic fields, from philosophy and nanoscience to biology and medicine.

The focus of its activities is the scientific endorsement of projects submitted by researchers. Yearly, approximately 3000 projects involving around 7000 scientists are funded by the SNSF with an annual total amount of approximately CHF 700 million.

### **Copies of this brochure can be obtained from:**

Swiss National Science Foundation  
SNSF

Wildhainweg 3  
Postfach 8232  
CH-3001 Berne

Tel.: +41 (0)31 308 22 22  
Fax: +41 (0)31 305 29 70  
E-mail: [nfp69@snf.ch](mailto:nfp69@snf.ch)

[www.snf.ch](http://www.snf.ch)  
[www.nrp69.ch](http://www.nrp69.ch)

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Editor  
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Swiss National Science Foundation SNSF  
Wildhainweg 3  
Postfach 8232  
CH-3001 Berne

Editorial  
Xavier Pilloud  
Matthias Meier

Graphics  
Senger und Partner, Zurich

Photos  
Hélène Tobler

### **NRP 69 in brief**

NRP 69 establishes a scientific basis and practical solutions for healthy nutrition and sustainable food production in Switzerland. The programme has an overall budget of 13 million Swiss francs and will continue until the end of 2018. Twenty-one research projects were approved in the initial tendering phase.

### **NRP 69 pursues the following goals**

- Generate knowledge to support the development of sustainable eating habits and food production in Switzerland
- Develop strategies against diet related diseases like diabetes and cardiovascular diseases
- Promote current and upcoming reform processes in the Swiss agricultural and nutrition sectors