



## **Agroscope Research Master Plan 2008–2011**



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Swiss Confederation

**Agroscope Changins-Wädenswil Research Station ACW**

**Agroscope Liebefeld-Posieux Research Station ALP**

**Agroscope Reckenholz-Tänikon Research Station ART**

Agroscope is the name for the three agricultural research stations

**Agroscope Changins-Wädenswil ACW**

**Agroscope Liebefeld-Posieux ALP**

**Agroscope Reckenholz-Tänikon ART**

Agroscope means to take a close look at agriculture: The name comes from the Greek »agrós« (field) and »skopein« (to view, to observe).

As part of the communication regarding the promotion of education, research and innovation for the period 2008 to 2011, the Swiss Federal Office for Agriculture was commissioned to draw up a research master plan for the agricultural policy area.

This document is an excerpt from the document "Research master plan for the agricultural policy area for the period 2008–2011", which was drawn up by the FOAG (Federal Office for Agriculture) together with Agroscope, FVO, SDC, SFOE, MeteoSwiss, FOEN, SFSO, FOPH and ARE.

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## Foreword by the President of the Agricultural Research Council<sup>1</sup>

### ***Agricultural research is an investment in future agricultural production, healthy foods and a landscape worth living in.***

Agricultural research, which is primarily based on the study of biological processes, depends upon sustained investment, since its research cycles are long term. Success is often achieved only after many years of intensive work, but is then all the more convincing.

A number of different institutions deal with questions of agricultural science. Problem-based work often requires inter- and transdisciplinary co-operation, which is why joint work between institutions is growing in importance. Inter- and transdisciplinary study poses a major challenge for all participants, as it is necessary to acknowledge that disciplinary ways of working, thinking and proceeding are of equal value, and to fuse them together into a united whole. However, mastering specific processes, which help to achieve harmonisation and build synthesis, will lead to greater knowledge.

Agroscope is a key player in the agricultural knowledge system and is therefore ideally placed to provide knowledge for agriculture, government and society, in order to meet future challenges successfully. Creativity, flexibility, power of innovation and hard work on the part of researchers play an important part in the process of obtaining this knowledge, i.e. in the research process. In the research process we must skillfully combine a mixture of creative development and planned procedures.

Why is planning important? Periodically Agroscope must look at strategic decisions and develop new strategies. Strategic planning helps Agroscope to identify its specific strengths and niches and to set new goals in constant comparison with its competitors. This is the only way Agroscope will become competitive in the knowledge market and important for its customers.

Clear aims are the prerequisite for excellent performance in research. Researchers aim for common goals which are based on strategy but at the same time leave room for creative thinking. I am convinced that the main aims and research programmes in this research plan for the period 2008–2011 are far-sighted and tackle current problems, yet also anticipate future challenges.

The Agricultural Research Council has actively assisted with the basic considerations underlying the research plan and has discussed various important points in depth.

I wish the employees of Agroscope great skill in implementing them. Their customers will thank them for it!

Jost Harr

Successful research requires long-term investment...

... as well as inter- and transdisciplinary study

Agroscope: providing knowledge through creativity, flexibility and power of innovation

Strategic planning and new goals for a strongly competitive Agroscope

Room for creative thinking

Assistance of the Agricultural Research Council

<sup>1</sup> The Agricultural Research Council is a permanent advisory committee selected by the Swiss Federal Department of Economic Affairs (FDEA). The Research Council makes recommendations on agricultural research to the Federal Office for Agriculture.



## Foreword by the Director of the Federal Office for Agriculture

### ***Agroscope targets its research studies at the agricultural and food sector as well as development in the rural and peri-urban areas.***

The natural conditions prevailing in Switzerland scarcely make it possible for our agricultural sector to produce agricultural products as mass-produced commodities. Our agricultural sector wishes to offer consumers safe, high quality and attractive products and wants to do it with respect for man, animals and the environment.

Swiss products should be worth their higher price by being healthy and tasty and encouraging well-being. Our products should work in favour of Swiss agriculture, agriculture which produces in harmony with man, animals and nature.

There is no doubt that the economic environment has become even tougher. Consumers would like high quality products, but are sensitive to prices. Agroscope must take account of this and provide basic information so that our agricultural sector is able to produce agricultural products efficiently and provide the public services laid down in the constitution effectively.

Changes in agriculture (including decline in rural population, falling proportion of added value of primary production in the added value of the national economy) pose important questions regarding the future shape of development in rural and peri-urban areas: what kind of multifunctional landscape will meet the economic, ecological and social demands of society and how can sustainable spatial development be achieved?

Our country with its sparse natural resources has traditionally created added value by its citizens making specific use of its spiritual potential. Our agricultural research, together with farmers, has also developed efficient production systems under difficult production conditions. In doing this, agricultural research has overcome obstacles and has produced convincing solutions. Today it is challenged more than ever, because the way forward in future lies increasingly via research programmes in partnership with others. (Disciplinary) system demarcation in research does not work if the demands of problem-orientated system research are to be met.

Our government research requires both proximity to and distance from the Confederation as sponsor. It needs proximity in developing strategy and in solution-orientated problem-solving, but distance is necessary in the choice of methods and in the results. Agroscope must – and will – take care that it maintains scientific independence. In the longer term, it will be in the government's and administration's interest that Agroscope's results are able to stand up to scientific examination. Scientific results are one thing; political interpretation and implementation can be quite another, for apart from scientific criteria, political framework conditions, which have no basis in science, sometimes have to be considered in politics.

It remains the mission of Swiss agricultural research to help our agricultural and food sector to overcome future challenges with courage, strength and far-sightedness. It goes without saying that as a federal institution Agroscope works independently.

Manfred Bötsch

Safe, high quality and attractive products...

... from agriculture in harmony with man, animals and nature

Agriculture which produces efficiently and provides public services effectively

Agriculture in a multifunctional landscape with sustainable spatial development

Agriculture under difficult production conditions supported by system-oriented agricultural research

Government research should contribute to social well-being whilst maintaining scientific independence

Agroscope works with courage, strength and far-sightedness





## Summary

The Confederation ensures that through sustainable, market-oriented production, agriculture makes an essential contribution to the secure provision of food for the population, maintenance of the natural basic elements of life, conservation of the cultivated landscape and decentralised land settlement.

In order to fulfil these tasks, the Confederation promotes agricultural research, among other measures. This is mainly undertaken by Agroscope, the three federal agricultural research stations of the Swiss Federal Office for Agriculture (FOAG).

Global security of food production is expected to be linked to considerable risks in the coming years. Increased demand for processed foods will raise the demand for cereals and will increase the proportion of cereals used for meat production at the cost of the proportion of cereals of breadmaking quality. Moreover, erosion and salinization of the soil, regional weather extremes such as drought and flooding and climate warming will increase the probability of global fluctuations in production and therefore related price fluctuations on world markets. This development is intensified by increasing competition between agricultural raw materials for food and for bioenergy.

Developments in trade policy are of great significance for Switzerland's agriculture and food industry. Facilities in agricultural free trade and free trade agreements will lead to further opening up of the Swiss agricultural market.

At the same time as the production of food, agriculture also provides other services demanded by society such as landscape conservation and maintenance of the natural basic elements of life. Opinion polls show that these services will continue to be expected in future and are valued highly by the public as a whole.

Changes in our way of life and demographic developments mean that the trend is moving towards finished products. At the same time, the price range of purchased products is becoming ever wider, because demand is increasing for standardized low price products for everyday consumption on the one hand and for quality products in the higher price bracket as luxury items on the other. In spite of price differentiation, however, all products are expected to provide high quality, safety and if possible a health-promoting effect.

Among the goals of agricultural policy, conservation of the cultivated landscape and conservation of natural resources are becoming more important. Agricultural policy 2011 is a further step in the reform of agricultural policy, which has been pursued logically for

Federal Constitution task

The federal agricultural research stations

Higher risk for security of food production

Further opening up of the Swiss agricultural market

Services provided by Swiss agriculture

Demand trends in the food sector

Agricultural policy 2011

International competition and technological change	<p>about 12 years. The key element of this policy is to reduce further the funds currently used for price support and to switch them to product-independent direct payments.</p> <p>A lead in knowledge and exclusive knowledge are becoming increasingly important factors for success in international competition. Technological change will transform agriculture and the agricultural industry in the long term. It will leave its mark and pose a major challenge to agriculture.</p>
Aims of federal government research for the agricultural policy area	<p>The aims set for government research for the period 2008–2011 are as follows:</p> <ol style="list-style-type: none"> <li>1. An economically efficient agricultural sector: competitiveness and innovation, safety and quality of foods at fair market prices, lower production costs.</li> <li>2. An ecologically and ethologically responsible agricultural sector: conservation and sustainable use of natural resources such as soil, water, air and landscape; biodiversity, improvement of material and energy efficiency, understanding of connections between ecosystems, assessments of consequences of technology, ecotoxicology in the agricultural sector, environmental services provided by the agricultural sector, animal-friendly livestock farming, animal welfare.</li> <li>3. Socially acceptable development of the agricultural sector: income situation in conjunction with quality of life, structural dynamics, possibilities for adjustment, impact on the countryside.</li> <li>4. Early warning: provision of knowledge for future challenges. Increasing importance of areas such as: nutrition and health, product innovation, quality and environmental standards, flows of goods, closed ecological cycles, climate change.</li> <li>5. Problem-oriented system research: effective problem-solving often requires transdisciplinary and innovative system approaches.</li> <li>6. Communication: research results must be made available to users in a customer-friendly way. Research must be transparent and must enter into media-effective dialogue with the general public.</li> </ol>
Agroscope's focal points for research	<p>Agroscope's main activity will continue to be the development and improvement of production systems in agriculture, but to a lesser extent. The cross-disciplinary areas of "agriculture-environment" and "decision-making bases for business management" as well as the areas of activity "animal health and animal welfare" and especially "product quality and product safety and their effects on human health" will be intensified.</p>
Research programmes	<p>In addition to the existing information platform ProfiLait, Agroscope will carry out three multidisciplinary research programmes in the period 2008–2011 in the fields of product quality/product safety, health and nutrition, competitive crop farming systems in lowland regions and development, implementation and monitoring of promising production systems in mountain regions. Characteristic features of the research programmes are the restricted time period with clearly defined targets, the interdisciplinary trend and co-operation with stakeholders, who will directly use and apply the research results.</p>
ProfiCrops	<p>ProfiCrops sets itself the aim of ensuring a future for Swiss crop farming in a mainly liberalized market and of strengthening consumer confidence in domestic products. In conjunction with partners, innovative products with high added value will be produced along the whole added value chain, new technologies will be developed and new business management findings made available.</p>
NutriScope	<p>NutriScope sets itself the aim of optimizing parameters which determine quality, safety and health along the food chain from cultivation to the ready-to-eat product. NutriScope wishes to make a major contribution to a healthy diet and thus to a healthy population.</p>

NutriScope also wants to make food of Swiss origin more competitive and to increase consumer confidence in the food chain.

AgriMontana aims to study and assess the economic, social and ecological impact of different land use systems in mountainous regions, including changing framework conditions and structures. In terms of policy advice, the programme therefore contributes to co-ordinated regional and sectoral policy and provides knowledge for implementation and transfer for sustainable development of the mountain region.

AgriMontana





## 1. Legal bases

On the basis of Article 104 of the Federal Constitution, the Confederation shall ensure – under the Federal Law on Agriculture (LwG) – that through sustainable, market-oriented production, agriculture makes an essential contribution to secure provision of food for the population, maintenance of the natural basic elements of life, conservation of the cultivated landscape and decentralised settlement of the land<sup>2</sup>.

In addition to other measures to achieve these objectives, as part of its agricultural policy the Confederation pursues scientific research, training and information services (gaining and passing on of knowledge)<sup>3</sup>, and manages the agricultural research stations<sup>4</sup>.

The tasks of the federal agricultural research stations (under the name of Agroscope) are set out in detail at ordinance level<sup>5</sup>. They promote sustainable, competitive agriculture, which preserves the natural resources soil, water and air and helps to maintain and encourage biological diversity. They also develop the scientific knowledge and technical bases for agricultural practitioners, training and information services. In addition, they draw up, monitor and evaluate agricultural policy measures, namely in the areas of ecological compensation, Integrated Production, organic farming, animal-friendly stock keeping and animal feeding. Furthermore, they provide basic information for new directions in agriculture and carry out enforcement tasks<sup>6</sup>.

Agroscope is therefore primarily tied to the research duty of the legislator and has to take account of the particular agricultural and social needs of our country. They serve to improve our well-being in the widest sense.

The research stations concentrate on applied research together with enforcement and inspection duties. This linking of applied research and enforcement and inspection ensures that optimum use is made of the most up-to-date know-how and a high-quality infrastructure for the enforcement tasks (synergies).

Federal Constitution

The Confederation pursues agricultural research

Tasks of the agricultural research stations

Agricultural and social needs

Applied research together with enforcement and inspection

<sup>2</sup> LwG, SR 910.1, Art. 1.

<sup>3</sup> LwG, SR 910.1, Art. 113.

<sup>4</sup> LwB, SR 910.1, Art. 114

<sup>5</sup> Verordnung über die landwirtschaftliche Forschung, VLF, [Ordinance on agricultural research] SR 426.10.

<sup>6</sup> LwG, SR 910.1, Art. 115.





## 2. Analysis of related area

### 2.1 Anticipated developments<sup>7</sup>

#### International development of supply and demand

According to prognoses<sup>8</sup> there will be a major increase in food consumption by 2030. By this date, consumption of animal products is expected to rise by 44 %. Higher demand for processed foods is anticipated particularly in developing and newly industrialized countries due to rising incomes. There will therefore be above average growth in global animal production and thus in demand for animal feeds. As a result of growing animal production the proportion of the world's cereal crop used for animal fodder is expected to double by 2030.

Global security of food production is expected to be linked to much greater risks than in the last 30 years. In the last five years it has only been possible to meet demand for cereals by resorting to reserves.

Erosion and salinization of the soil, regionally unfavourable weather conditions such as drought and flooding and growing problems due to climate warming and water shortage increase the probability of global fluctuations in production and related price fluctuations on world markets. The margin for further expansion of agricultural production will narrow in future. In connection with extremes of weather (drought and heavy precipitation), we must expect an increasing risk of disease and pest infestation or of availability of water. On the other hand, new cultivation possibilities and potential for new products in crop farming will arise.

Energy is expected to become even more expensive. Food production is greatly affected by this: on the one hand, food production, processing and distribution are very energy intensive. On the other, agricultural raw materials (sugar, maize and grain for ethanol production) as well as oil plants as biodiesel are of interest for energy production. These are

Increasing demand for processed foods

Higher risk in global security of food production

Fluctuations in production and prices due to climate change

Growing competition between agricultural raw materials for food and for bioenergy

<sup>7</sup> In May 2005 members of the Accompanying Group of Experts (BEG) of the Federal Office for Agriculture's research stations (Agroscope) were asked in writing to give their opinion on high and low priorities for Agroscope's activities.

<sup>8</sup> FAO (2003): Agriculture mondiale: horizon 2015/2030

then in competition with food production. Sustainable use of natural resources will become a lot more important in future.

### **Swiss agriculture and trade policy**

Further opening up of the Swiss agricultural market

Developments in trade policy are of great significance for Switzerland's agriculture and food industry. In future, further opening up of the Swiss agricultural market must be expected due to the conclusion of the WTO Doha Round, further bilateral agreements with the EU as well as agricultural free trade or free trade agreements with other countries. Of the WTO's obligations, not only border protection, but also internal market support and export subsidies will be affected. Implementation of the Doha Round is also expected to reduce the relative price difference with the EU for agricultural raw materials.

### **Demand trends**

Swiss agricultural services

At the same time as producing food, agriculture provides other services demanded by society such as landscape conservation and maintenance of the natural basic elements of life. Opinion polls show that these services will continue to be expected in future and are valued highly by the public as a whole. However, concrete ideas and specific expectations can differ. Some want a well-kept and diverse landscape such as they are currently familiar with. Others would like more wilderness, especially in areas with unfavourable natural conditions for agriculture and high costs for maintaining the infrastructure.

Changes in our way of life and in demography increase the trend towards finished products,...

Changes in our way of life and a higher average age of the population in Switzerland will affect demand for food and its processing in the coming years. As the population ages, consumption per person will fall. At the same time, numbers of single-person households in all age groups will rise markedly and the trend towards small amounts and pre-packaged products will grow.

... standardized products at lowest prices and quality products in the higher price bracket ...

Furthermore, two very different demand trends can be seen. Demand is primarily for standardized products at the lowest prices for everyday use. At the same time and to a limited extent, consumers from all social strata also want quality products in the higher price bracket. In general, domestic agricultural raw materials are preferred to imported ones in the higher priced quality brackets.

... and high quality and safety with additional benefits

There is a boom in the market for health products. Growing numbers of people want to increase their physical and mental well-being and to prevent health problems through healthy eating. A lucrative field is opening up for healthy foods of high quality and safety, for example wellness-products and functional food, that is foods with additional benefits. Apart from the effects on health, enjoyment is also a major factor.

## **2.2 Agricultural policy framework**

Conservation of the cultivated landscape, preservation of natural resources

Among the aims of agricultural policy, safeguarding supply is losing ground, whilst conservation of the cultivated landscape and preservation of natural resources are growing in importance. Since the beginning of the nineties, agricultural policy has been fundamentally reformed in three stages.

Government's sustainability plan

In the 2005 Agricultural Report, the Federal Office for Agriculture (FOAG) presented indicators based on the Confederation's sustainability plan<sup>9</sup>. A total of eleven indicators give information on the development of sustainability in the three areas economy, ecol-

<sup>9</sup> BLW 2005: 2005 Agricultural Report of the Federal Office for Agriculture, p. 99–116

ogy and the social field. Productivity of labour improved in the Swiss agricultural sector between 1990 and 2004 by 1.4 % a year. As ever the gap between earned income in agriculture and that in the rest of the population must be judged critically. From the point of view of sustainability, developments in the ecological indicators were positive. However, changes in the indicators have been slower in recent years, although not all the target values have yet been reached. The need for agroecological action and research therefore continues to lie in the nitrogen and phosphorus balances, ammonia emissions and biodiversity.

Agricultural policy 2011<sup>10</sup> is a further step in the reform of agricultural policy, which has been pursued logically for about 12 years. The key element of Agricultural policy 2011 is to make a big reduction in the funds currently used for price support and to switch them to product-independent direct payments. Export subsidies are completely abolished and funds for internal market support more than halved. Moreover, duty on animal feeds is reduced. This will bring Swiss price levels substantially closer those of the EU without using additional government funds and without endangering the socially acceptable development of agriculture. The fall in prices mobilises potential for increasing productivity and lowering costs, which leads to greater competitiveness. Production and processing will be better in line with the market, because support for types of processing with little added value disappears. As a secondary matter, valorisation and creating added value for agricultural products is to be improved by targeted measures. Lower prices reduce the incentive to produce intensively in unsuitable locations. A programme to improve resources efficiency is intended to promote utilization of ecological improvement potential.

Agricultural research is in line with these framework conditions and orientates its activities accordingly.

Agricultural policy 2011

Orientation of agricultural research

<sup>10</sup> EVD/BLW, 2005: Agricultural Policy 2011: further development of agricultural policy. Bern.



### 3. Knowledge as basis for action

#### 3.1 Knowledge as basis for market success

Being in the lead with knowledge requires flexible, interdisciplinary and transdisciplinary research

A lead in knowledge and exclusive knowledge are becoming increasingly important factors for success in international competition. Boundaries between research and development, production, processing, marketing and sales are becoming ever more fluid. Flexible research in line with the requirements of the whole added value chain is a major prerequisite for success in the market. Depending on the question, environmental and natural sciences, plant sciences, livestock sciences including veterinary medicine, food and human nutrition sciences and economics must be included. This requires more interdisciplinary research and co-operation with end users (transdisciplinary research). The term "Knowledge Based Bio Economy" (KBBE) is used in this context in the EU.

#### 3.2 Knowledge as basis for efficient fulfilment of public duties

Demand for public goods

Agricultural research impacts on the area of public goods. There is no market for these (as for private goods), but there is public demand. Public goods means:

- a) public-benefit services such as for example secure food provision for the population, protection and improvement of natural basic elements of life (soil, water, air), conservation of the cultivated landscape, decentralised settlement;
- b) ecological and ethological services, such as for example production which takes account of the environment (Integrated Production, organic farming), special ecological services for promoting biodiversity (such as wildflower strips, especially extensive meadows) and particularly animal-friendly housing systems.

#### 3.3 Technological change

Technological change shapes and challenges agriculture

In the long term, technological change will change the face of agriculture and the agricultural industry. It will leave its mark and pose a major challenge to agriculture. Innovations will have an impact at different levels in agriculture:

- Biological-chemical innovations will continue to result in cost reductions and yield increases.
- EDP and information technology will profit from developments at the level of system architecture right down to nanotechnology, where new materials or readers and storage media increase efficiency. These developments will have an impact both in the field of agricultural engineering and in the areas of institutional organisation and biology/chemistry. Key words are process automation, computer control, new biotechnical methods and applications of genetic engineering.
- Innovations lead to precision agriculture and to multifunctional land use. The use of biological-chemical, mechanical-electronic and organisational-institutional innovations leads to the reduction of production costs (per unit) for food and for related information as well as to greater market transparency and thus to globalisation of food markets.



## 4. Agroscope's strategy and "mission statements"

Vision Agroscope has the following vision<sup>11</sup>:

***Agriculture for man and the environment: we carry out research in favour of healthy food and a landscape worth living in.***

Highest aim Highest aim for Agroscope<sup>12</sup>:

***In agricultural research we are the driving force for sustainable development in the agricultural, nutritional and environmental sector for Switzerland and the Alpine region.***

Agroscope works in the applied field

### **Purpose and direction of Agroscope<sup>13</sup>:**

Agroscope acquires scientific knowledge and technical basic information for agricultural and environmental policy decisions and for enforcement of legislation. It works in the applied field and is oriented towards the early recognition of problems, which demand agricultural policy action in the medium and long term. It develops, monitors and evaluates agricultural and environmental policy measures as well as animal protection measures.

Agroscope is geared towards the client

Agroscope is geared towards the needs of clients, more precisely those working in agriculture in the first instance as well as consumers, general public and administration.

In its activities Agroscope takes account of the following framework conditions:

- a multifunctional, competitive direction for Swiss agriculture;
- preservation of human and animal health;
- careful and sustainable handling of the natural resources soil, water, air, flora, fauna and landscape as well as preservation and promotion of biological diversity;
- the national and international environment.

<sup>11</sup> BLW, 2002: Foresight für die Forschung des BLW, Bern. [Foresight for FOAG research]

<sup>12</sup> BLW, 2002: Foresight für die Forschung des BLW, Bern. [Foresight for FOAG research]

<sup>13</sup> Verordnung über die landwirtschaftliche Forschung (VLF) [Ordinance on Agricultural Research] of 26 November 2003, SR 910.1

Agroscope is responsible for quality assurance of the processes developed and products produced. Quality assurance

**Structures and management of Agroscope**

Since 1 January 2006, there have been only three agricultural research stations:

ACW, ALP, ART

- the Agroscope Changins-Wädenswil Research Station ACW;
- the Agroscope Liebefeld-Posieux Research Station ALP;
- the Agroscope Reckenholz-Tänikon Research Station ART.

The Director of the Swiss Federal Office for Agriculture (FOAG) and the three Directors of the research stations together form the management of Agroscope. The management team, supported by the research staff of the FOAG, manages Agroscope and is responsible for strategic direction and definition of aims and their achievement. Each of the three Agroscope Directors is responsible for one of the strategic areas Planning/Resources, Research/Development and Communication/Exchange of Knowledge.

Tasks of Agroscope management



## 5. Agroscope's sustainability targets for the period 2008–2011

Orientation towards the needs of consumers, livestock and environment

The economic environment has become tougher for Swiss agriculture compared with past years. Agroscope therefore concentrates on the specific needs of Swiss agriculture and of the Swiss food sector. Sustainability, animal-friendly and environmentally compatible production methods, which are visible and can be communicated to the wider public, as well as quality leadership remain important for Swiss agricultural production as distinguishing factors in a more open market. Priority is given to the reduction of costs and making products which are oriented towards current and newly arising needs of consumers. Agroscope supports agriculture in the development of innovative products and helps to safeguard agricultural income, including in the peripheral and mountain regions, and to provide a healthy nutritional basis for the public.

### 5.1 Sustainability target: economically efficient agricultural sector

Competitive and innovative agricultural production

In the long run the agricultural sector can only produce if it is successful in marketing. Further liberalisation of market regulations and greater opening up of the market will increase competition. This being so, the agricultural sector must continually improve its competitiveness in terms of price and quality in order to maintain or increase its market share in spite of stiffer competition. Agricultural research is intended to promote the competitiveness and innovation of agricultural production. This is achieved primarily by reducing production costs by means of organisational, biological and technical advances. In doing so it should take account of both the strict quality requirements demanded by consumers and animal-friendly and environmentally compatible forms of production.

Top quality at fair market prices

With increasing competition, top quality at fair market prices is a decisive prerequisite for the ability of the Swiss agricultural sector to compete in markets both at home and abroad. It will continue to be important to safeguard and improve these comparative advantages in future. Agricultural research should aim to foster food quality, food safety and the health-promoting aspects of foods, thereby strengthening consumer confidence in Swiss food.

Efficient and effective execution of inspection and enforcement tasks in line with international standards should continue to be assured in order to protect the population, maintain the reliability of our agricultural products on the internal market and preserve the exportability of agriculture.

Execution of inspection and enforcement tasks

Climate change is altering the conditions for agriculture in Switzerland too. Basic information from research can support adaptation to new conditions and thus help to minimise risks and exploit new options.

Awareness of risks and new options

Agricultural policy measures need agricultural research to provide information on the market, the supply situation regarding agricultural products, the development of demand and the impact of international agreements (EU, WTO). Agricultural policy also needs information on the income situation in agriculture and the effects of agricultural policy measures on this situation together with relevant prognoses. Agricultural research is also required to provide monitoring and prognoses on the sustainability of Swiss agriculture in comparison with other countries on the basis of selected indicators.

Support for government decision-making

The following government offices are involved in achieving this aim as part of their activities in partnership with the FOAG:

Participating government offices

- Swiss Agency for Development and Cooperation (SDC)
- Swiss Federal Veterinary Office (FVO)
- Swiss Federal Office for Meteorology and Climatology: MeteoSwiss
- Swiss Federal Office for Spatial Development (ARE)

## 5.2 Sustainability target 2: ecologically and ethologically responsible agricultural sector

In addition to its production function, agriculture is also expected to conserve socially-important natural resources such as air, water, soil, landscape and biodiversity. These services, which are oriented towards the needs of society, are remunerated in the form of direct payments and make up a large part of agricultural revenue. Agriculture's high ecological standards support the positive image of Swiss food both at home and abroad.

Agriculture should conserve natural resources and ...

In order to provide and improve these services, both in integrated production and organic farming, agricultural research must develop production methods, which take account of environmental needs and animal welfare. Natural science bases of environmentally compatible production must be developed, which take greater account than previously of biological action principles and regulation systems. The aim is to produce food and at the same time to conserve and make efficient use of available resources.

... take account of the needs of livestock and the environment

Agricultural research should contribute towards this by studying connections between ecosystems and showing how human activity affects agricultural ecosystems. It should demonstrate the positive and negative effects of agricultural production and land use on the natural resources of soil, water, air, flora, fauna and landscape. The effects of external natural influences and development trends of natural balance and climate as well as those of external man-made effects on agricultural systems must also be assessed.

Agricultural research should study connections between ecosystems

Agricultural policy should also monitor the impact of its decisions on the environment. This involves assessing the quality of the environment with reference to agricultural activity. Using agroecological indicators and targets, agricultural research is able to measure the impact of the agricultural sector on the environment in a concrete way and to evaluate the state of development of agricultural environmental services compared with the state desired by society.

Support for government decision-making

Monitoring developments in the area of new technologies	In order to take account of the concerns of the general public, agricultural research should continue to monitor with particular care developments in the area of new technologies, especially genetic engineering. Increasing importance is attached to conducting technology impact assessments, drawing up ecological balance sheets or life cycle analyses of products. In this way independent expert knowledge should be obtained so that a neutral assessment can be made of the latest developments for the benefit of the general public.
Göteborg Protocol	In the Göteborg Protocol, Switzerland undertook to reduce various air pollutants. The reduction of sulphur dioxide, nitrogen oxides, ammonia and volatile organic compounds by 2010 should lead to a fall in ozone peak values, summer smog and air pollution caused by fine dust. Around 90 % of ammonia emissions come from agriculture. This nitrogen compound is a major cause of the acidification and eutrophication of natural and near-natural ecosystems such as forests and raised bogs and a major component of aerosols. Low-emission storage and spreading techniques for farm manure, optimisation of the relevant flows and processes of the nitrogen cycle and careful soil cultivation are called for in order to improve air quality, and to protect man, ecosystems and climate.
Kyoto Protocol	In the Kyoto Protocol, Switzerland undertakes to reduce emissions of six greenhouse gases by 8 % compared with the 1990 level. In the period 1990-2004, emissions of methane and nitrous oxide (laughing gas) fell and those of synthetic gases rose. On the other hand, CO <sub>2</sub> -emissions, which make up 80 % of all greenhouse gas emissions in Switzerland, remained constant. Climate-relevant gases are emitted into the atmosphere from livestock farming and cultivated land and some are also taken up by cultivated land. Studies on the long-term potential of agricultural soils to reduce atmospheric CO <sub>2</sub> carbon will broaden understanding of sources and lowering of greenhouse gases in agriculture. Renewable raw materials will become more important in CO <sub>2</sub> -balancing in future.
Conservation and sustainable use of phyto-genetic resources	On 18 June 2004, Switzerland ratified the international Treaty on Phytogenetic Resources for Food and Agriculture. The aims of this international treaty are conservation and sustainable utilization of phytogenetic resources for food and agriculture and balanced and fair sharing of the benefits resulting from the utilization of such resources.
Complex of questions of global significance	With its research activities in the areas of sustainable use of natural resources, biodiversity, ecosystem research, emissions of climate-relevant gases and genetic resources, Agroscope deals with complexes of questions of global significance. The knowledge and methods developed should be incorporated to a greater extent into the development cooperation activities of the Swiss Agency for Development and Cooperation (SDC).
Participating government offices	The following government offices are involved in achieving this aim as part of their activities in partnership with the FOAG: <ul style="list-style-type: none"> <li>• Swiss Federal Office for the Environment (FOEN)</li> <li>• Swiss Agency for Development and Cooperation (SDC)</li> <li>• Swiss Federal Office for Meteorology and Climatology: MeteoSwiss</li> <li>• Swiss Federal Office for Spatial Development (ARE)</li> </ul>

### **5.3 Sustainability target 3: socially acceptable development of the agricultural sector**

Agriculture as economic sector

In remote, structurally-weak rural areas, agriculture plays a more important role as economic sector than in urban developed regions. Many remaining non-agricultural jobs (mechanical workshops, retail trade, schools) depend directly on farming families as cus-

tomers. Well-maintained, cultivated landscapes make attractive residential locations. Tourism also profits from landscape conservation and preservation of agriculture's rural traditions.

If agriculture, along with other sectors of the economy, is to be able to survive in such a region, it needs existing sources of income to be improved and new ones to be created. Agricultural research should support and further develop the existing agricultural production systems in these regions (such as e.g. regional milk and meat production systems with products typical of the region). However, it should also help to create new prospects (e.g. new production areas such as medicinal plants) in agriculture.

The aim is to increase added value in rural areas generally. Agricultural research, together with the agencies involved (including ARE and SECO), is able to analyse the interconnection of agriculture with other sectors of the economy, point out the added value potential of agriculture and provide basic information for improving added value.

Agricultural policy measures and economic development in general affect the structural development of agriculture. Government wants this structural change to be socially acceptable. This presumes that other sectors of the economy are able to absorb workers moving out of agriculture. However, this also means that the move out should be acceptable for farming families (debt, image, occupational prospects). Research provides the government with information about the current economic situation of those working in agriculture and about current living conditions and socio-cultural developments in rural areas. It should also develop models, which are able to predict the possible effects of agricultural policy measures on structures in agriculture and to show and estimate development prospects.

The following government offices are involved in achieving this aim as part of their activities in partnership with the FOAG:

- Swiss Federal Office for Spatial Development (ARE)
- State Secretariat for Economic Affairs (SECO)
- Swiss Agency for Development and Cooperation (SDC)

Agricultural research should further develop production systems, create new prospects and ...

... increase added value in rural areas

It should inform government and indicate development prospects for those working in agriculture

Participating government offices



## 6. Agroscope's process targets for the period 2008–2011

### 6.1 Process target 1: early warning

Providing knowledge for monitoring future developments

Foresight

Health, differentiated range of goods, rural areas, integrated solutions for customers, technological innovations, resource efficiency, climate change, water quality, quality standards

Alongside work on current questions, which tend to be short or medium term, agricultural research has the important task of providing knowledge for monitoring future developments.

In the year 2000 the FOAG initiated a Foresight Process<sup>14</sup>. The method used was the scenario technique<sup>15</sup>. The information basis for the group<sup>16</sup> drawing up the scenarios<sup>17</sup> was a questionnaire sent to experts<sup>18</sup>.

Below are listed areas which will be of greater importance in future:

- Demographic and social developments mean that in future the relationship between food and health will become increasingly important. In this area, agricultural research with suitable partners must make available its know-how so that our agricultural sector takes account of future needs and seizes market opportunities.
- In the food area, competition will mean that the goods on offer will become even more differentiated, e.g. through labels, properties, content of particular ingredients, etc. Here too agricultural research will make a key contribution in certain areas.
- Long-term conservation of rural areas will become an important social topic with regard to possible developments in agriculture. A well-kept landscape and a high level of biodiversity will play a leading role.

<sup>14</sup> Foresight is an art and the ability to anticipate the future so that the necessary action can be taken early enough.

<sup>15</sup> Scenarios can be created as coherent descriptions of possible future situations, based on interactions of the most important influential factors. Future-oriented need for action is deduced from them.

<sup>16</sup> The Agricultural Research Council was represented in the group.

<sup>17</sup> See: Schwab P. et al. (2002): Foresight – mit Szenarien die Zukunft gestalten. *Agrarforschung* 9: 468–473.

Schwab P. et al. (2003): Foresight – using scenarios to shape the future of agricultural research. *Foresight* 5: 55–61.

<sup>18</sup> See: Schwab P. (2002): Vorausschauend in die «Zukünfte». *Agrarforschung* 9: 96–101 [P. Schwab 2002: Looking into the "futures". *Agricultural research* 9: 96–101].

- Customer care: the results of research can no longer be communicated in isolation. They must be made available to customers in “packets” of integrated solutions. This trend will continue to grow.
- Technological innovations [e.g. environmental, bio- and nanotechnologies] must be integrated into production processes in order to improve the competitiveness of agriculture. Proper attention must be paid to discussion between science and society and to social acceptance of new technologies.
- Energy and raw materials: energy efficiency as well as careful handling of resources such as soil, water and phosphorus are becoming crucial for maintaining our prosperity. Agriculture will also make a contribution to this<sup>19</sup>.
- Global climate change will alter the climate and meteorological conditions in Switzerland, especially in the Alpine region. In terms of early warning, it is important to scale global climate models to Switzerland and to predict expected developments in different regions of Switzerland so that suitable land use and adaptation strategies can be developed for Swiss agriculture.
- As western Europe's surge tank, maintenance of the quality of waters, which also act as a source of drinking water for other countries, will be an important topic for Switzerland. Agricultural research is called on to develop agricultural methods, which do not damage water quality.
- Quality standards versus cross-border flows of goods: protection measures regarding imports of agricultural products often relate to the required quality standards. Sometimes there is suspicion that protectionist measures lie behind these. This kind of dispute, which is often based on scientific expert opinion, will continue to increase with the growth in cross-border flows of goods.

Agricultural research must continue to be allowed sufficient scope in future so that good researchers with intuition and creativity can find solutions for the future of agriculture and nutrition, enabling the impossible to enter the realm of the possible. Here risk, chance and luck play an important part<sup>20</sup>.

Intuition and creativity

## 6.2 Process target 2: problem-oriented system research

“Even in oral traditions, agriculture has always been perceived as a system ... More than ever, the science of agriculture stands at the center of a broader system integrating human

System research

<sup>19</sup> The present efficiency rate in the use of nitrogen is less than 27 % and 58 % in the case of phosphorus. In this connection, the re-establishment of closed cycles of substances will become more important. Energy efficiency in agriculture too is to be increased and the use of renewable resources (including energy) promoted. As far as generating energy from biomass is concerned, questions are arising regarding quality assurance in the material area, e.g. quality of fermentation material and compost. In the first place, biogenic waste and waste materials are to be used to generate energy from biomass in Switzerland. However, there could also be a certain development potential in the area of renewable raw materials or energy crops. The question arises e.g. to what extent ecological compensation areas could be used simultaneously for energy and which mixed crops could have both an ecological benefit and a high energy yield.

<sup>20</sup> For example present success in the introduction of more environmentally-friendly production methods in Swiss agriculture could scarcely have taken place without the visionary intuition and scientific preliminary work of enlightened and determined researchers. In this connection, attention should be drawn to a fundamental problem, namely the different timescales of research and practice. In most cases, government and practitioners expect research to provide short-term “ready-made” recipes which are simple to implement. On the other hand, research results connected with biological systems generally require longer system-oriented preparation

society and its physical environment"<sup>21</sup>. In this quotation from André and Jean Mayer, agricultural research is described as system research. The subjects studied by system research are complex natural, technical and social systems.

From disciplinary to inter- and transdisciplinary approach

The research approach based on system theory brings the integral or system view to the fore. The system approach promotes co-operation between individual disciplines and customer involvement. – In short, we are travelling further along the path from a disciplinary to an inter- and transdisciplinary approach, as is shown in the diagram below.

From product to system

The system approach focuses less on individual products or processes and more on the dynamics and interaction between the different system elements. Attention must be given to non-linear connections typical of most biological systems which can lead to complex behaviour patterns. Examples are study of nutrient dynamics and plant individuals in the population, the development of integrated plant protection plans and strategies, the support of system-stabilising elements in the landscape or the analysis of the economic and ecological impact of changed economic and ecological framework conditions, for example globalisation. – In short, we are travelling further along the path from product to system.

Innovation

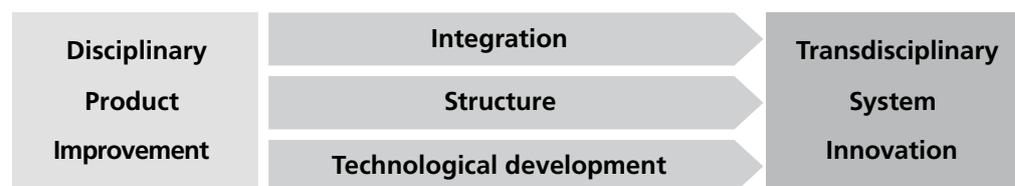
In general a distinction is made between three types of innovations<sup>22</sup>:

1. Product innovations: i.e. innovations regarding new products on offer where these can refer to quantitative, qualitative, time or geographical aspects.
2. Process innovations, i.e. innovations in the service provision process with regard to efficiency and financing.
3. Social innovations, i.e. innovations in the (inter)personal area, especially in the management and organisation system of the undertaking.

Examples of innovations are: manufacturing products, which create needs and trying to meet these better with new products. Developing technologies, which pose no danger to the environment (nature, employees, society) or which pollute the environment less (e.g. savings in material consumption, recycling of materials, substitution of hazardous by harmless substances, energy saving in production).

From improvement to innovation

The aim is to move from the improvement of processes and/or products to the innovation of processes and/or products. – In short: we are travelling further along the path from improvement to innovation.



**Fig. 1. Path to problem-oriented system research or "systems innovation"**

Networks for system-oriented, integral outlook with long-term horizon

The "systems innovation" approach is demanding:

- If, for example, systems are developed along the food chain or production systems in agriculture, then new networks with different partners (stakeholders) are necessary.
- If "systems innovations" are developed, then there is a fundamental change in the demands made on undertakings, scientific institutions and government departments because system-oriented, integral outlooks are called for.

<sup>21</sup> Mayer, A., Mayer, J. (1974): Agriculture, the Island Empire. Daedalus (Summer) 103: 83–95.

<sup>22</sup> Thommen, J.-P. (2004): Managementorientierte Betriebswirtschaftslehre, Versus Zürich, 870–871.

- “Systems innovation” requires more transdisciplinary co-operation between contracting bodies, customers and experts, between private institutions or individuals and public institutions. “Systems innovation” requires more studies with a long-term horizon and more synthesis work and analysis.

### 6.3 Process target 3: communication and knowledge management

Today's rapid channels of communication generate a huge amount of information, which must be continually updated. Knowledge is therefore constantly expanding and at the same time becoming more specialised and short-lived. However, due to the overwhelming flow of information, there is a danger that it is selected at random and that useful information is often overlooked.

In communication with the general public, Agroscope places importance on the fact that it emphasizes origin, traditions and species diversity and highlights the typical characteristics of Swiss products. Consumer demand for information regarding origin and quality of products and that of producers concerning the characteristics of the market are to be given high priority. Furthermore, ways of creating added value in the agricultural market should be indicated.

Agricultural research has the task of participating in the adaptation and development of agriculture as a whole and in its technical and scientific aspects in particular. It fulfils this task by producing, verifying and passing on knowledge and expertise. In doing this it puts knowledge together to make a whole, thus making the production of foods and the countryside comprehensible; however, it also analyses society and the way it functions.

Agricultural research should be aware of the authority, which it wields through the transfer of its knowledge, and mediate between science and society. Transmission of knowledge and its implementation in production must be directed towards technical innovation, because this is crucial for maintaining the industry's competitiveness. To this end Agroscope combines scientific disciplines and pragmatic knowledge to deal with subjects and questions of general, current interest.

Agroscope wants to strengthen further its role in social integration by awakening young people's interest in social and environmental problems. It wants to help to make training in agronomy more attractive for young people.

Further education as cornerstone of the knowledge society must be adapted to the development of practical needs. It should promote the transfer of knowledge gained and be based on an integral approach. In this way a network of specialists can develop which favours the formation of partnerships between industry and educators. It is important, therefore, to maintain a permanent dialogue between educators and practitioners, to ensure objectivity and transparency of information and to secure the reliability and competence of open-minded educators who enjoy innovation.

The desired exchange of information and transfer of technology should integrate Agroscope more closely into the European scientific community first and foremost, but also into the global one. Agricultural research projects are oriented in such a way that they are compatible with European models and strengthen the presence of Swiss agricultural research, engineering and technology abroad. Scientific and technical expansion will have a sustainable effect on political decision-making.

Agroscope wants to build up an efficient agricultural knowledge system. The transfer and exchange of research results in particular is to be promoted and all relevant target

Overwhelming information offer

Communication with the general public

Producing, verifying and imparting knowledge

Being aware of authority

Awakening interest, increasing attractiveness

Dialogue with educators and practitioners

Integration into the global scientific community

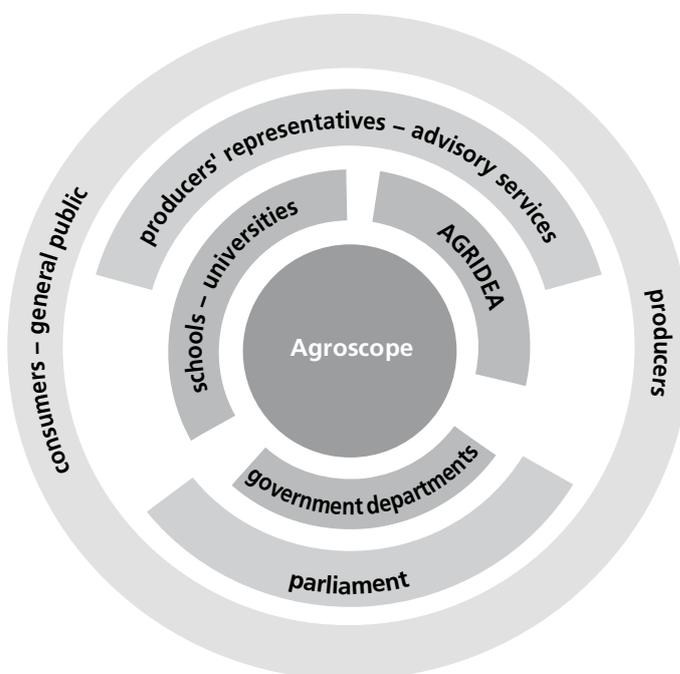
Agricultural knowledge system

groups<sup>23</sup> included (Fig. 2). This will ensure a targeted, effective communications platform tailored to current and future challenges for Agroscope with the National Stud Farm and AGRIDEA<sup>24</sup>.

Communication aims:  
reliable, fast, neutral

Agroscope wants reliable, apolitical, neutral communication which is acceptable to partners. Scientific information is to be communicated as precisely as possible and technical information as quickly as possible.

**Fig. 2. Distribution pathways for exchange of knowledge from Agroscope's point of view. E.g. Agroscope communicates with producers via AGRIDEA and advisory services. However, there is also direct exchange of knowledge with producers.**



<sup>23</sup> The spectrum of Agroscope's customers ranges from research partners via school/advisory services, authorities, interbranch and specialist organisations, farmers' associations, government, non-state organisations, industry/trade, producers, press/media to consumers and the general public. Agroscope places importance on customer-specific distribution pathways and means of communication specific to target groups.

<sup>24</sup> From 1 January 2006, AGRIDEA is the new joint name for the "Landwirtschaftliche Beratungszentrale" [Agricultural Information Centre] Lindau, its sister organisation "Service Romand de Vulgarisation agricole" and the "Schweizerische Vereinigung für Beratung in der Landwirtschaft" [Swiss Association for Advisory Services in Agriculture]. With its centres for further education, information and documentation as well as advisory services and process monitoring, the AGRIDEA helps to find new, accessible ways on farms and in the countryside.

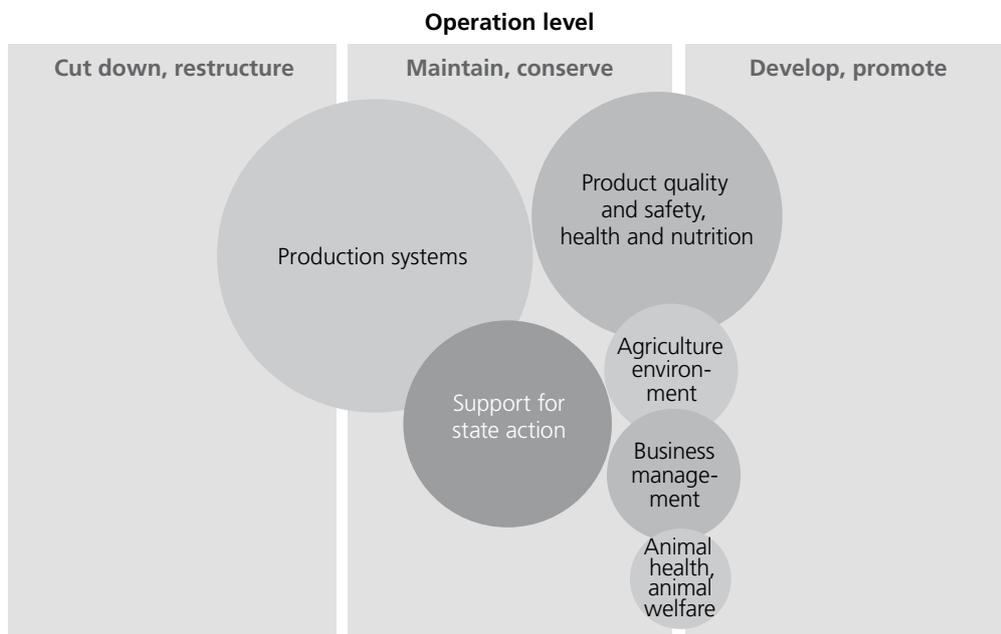


## 7. Implementation of the 2008–2011 research master plan

### 7.1 Agroscope’s portfolio for the period 2008–2011

The Agricultural Research Council and Agroscope have given joint consideration to the aims, expected developments in related areas<sup>25</sup>, needs of stakeholders<sup>26</sup> and strengths/weaknesses profile of the research stations. From this they drew the focal points for Agro-

Focal points for Agroscope’s study and research



The size of the circle is proportionate to the number of research topics within each area.

**Fig. 3. Reweighting of focal points for Agroscope’s study and research 2008–2011.**

<sup>25</sup> Including: AP 2011, WTO negotiations, technical developments.

<sup>26</sup> Cerutti Fabio (2005): Consultation of members of the Accompanying Groups of Experts of the research stations concerning high and low priorities in Agroscope activities. Bundesamt für Landwirtschaft, Bern.

scope's study and research for the period 2008–2011<sup>27</sup>. The figure 3 shows how the focal points are to be achieved.

Commentary on the portfolio:

- Agroscope's main research area will continue to be the development and improvement of production systems in agriculture, but to a lesser degree.
- Product quality and safety – as far as impact on human health – will be Agroscope's second most important research area. This area is to be expanded further.
- Agroscope's third most important research area is support for state action. This area is closely connected to "product quality and safety" and is to remain the same size.
- The cross-disciplinary areas "agriculture-environment" and "decision-making bases for business management" together with the research area "animal health and animal welfare"<sup>28</sup> are to be expanded.

## 7.2 Research programmes

Cross-disciplinary research

Practice-relevant, solution-oriented research is essentially always cross-disciplinary, because important problems of the real world always contain aspects, which go beyond the boundaries of individual sciences. New scientific knowledge is increasingly produced in interdisciplinary contexts and from there is transferred as the basis for innovative products and services in social areas of application.<sup>29</sup>

Agricultural research is system research

This is particularly true of agricultural research. The questions it poses, for example on the sustainability of land use, have scientific, technological and socio-economic dimensions, which can only be studied by means of interdisciplinary research plans. That is why agricultural research regards itself as system research. Therefore, in order to achieve its research aims, it must ensure that the different specialist areas of agricultural science such as crop farming and livestock sciences, ecology, economics and social sciences, technology and environmental sciences, are sufficiently represented in terms of content.<sup>30</sup>

Research along the whole added value chain

Moreover, the boundaries between production, processing, marketing, consumption and disposal are always fluid: flexible research in line with the needs of the branch across the whole added value chain is necessary. This requires more transdisciplinary research involving customers, namely producers and consumers, operators upstream and downstream, branches and depending on the subject, interest groups such as environmental and consumer organisations.

What is a research programme?

Answering complex, key questions requires inter- and transdisciplinary approaches and system thinking and a good way to start is with research programmes. A research programme is a research project in which several players participate in a co-ordinated way with a common aim within a project network. It is managed according to the principles of research network management.<sup>31</sup> The results of a research programme are communicated in a co-ordinated way which is aimed at implementation.

<sup>27</sup> BLW (2005): Überblick über die Portfolios der Forschungsanstalten von Agroscope [Summary of the portfolios of Agroscope's research stations], Bundesamt für Landwirtschaft, Bern.

<sup>28</sup> Aspects of animal health and animal welfare in connection with agronomic practices such as keeping and feeding of livestock. These activities are closely co-ordinated with the Swiss Federal Veterinary Office (FVO).

<sup>29</sup> Deutsche Forschungsgemeinschaft (2005): Perspektiven der agrarwissenschaftlichen Forschung. WILEY-VCH Verlag, Weinheim, modifiziert.

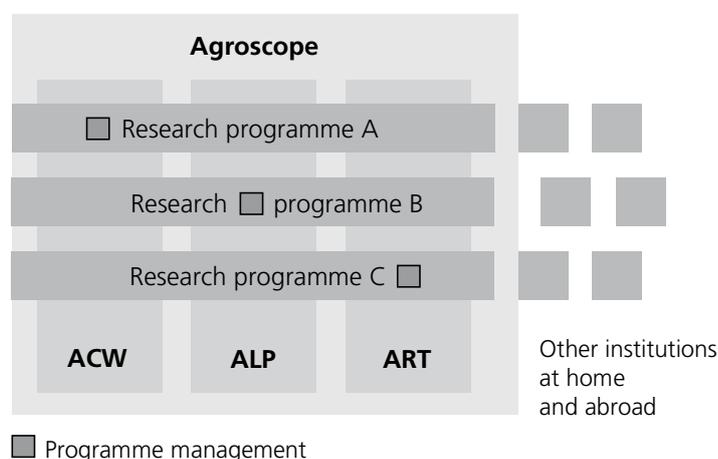
<sup>30</sup> Deutsche Forschungsgemeinschaft (2005): Perspektiven der agrarwissenschaftlichen Forschung. WILEY-VCH Verlag, Weinheim.

<sup>31</sup> Defila, R. et al. (2006): Forschungsverbundmanagement, Handbuch für die Gestaltung inter- und transdisziplinärer Projekte. Vdf Hochschulverlag AG an der ETH Zürich.

Simplifying the structures of Agroscope from 1 January 2006 was intended to further greatly the launching of subject- and target-oriented, cross-disciplinary programmes within but also outside Agroscope (Fig. 4). Efforts are therefore being made to set up synergetic co-operation with other research institutions.

Within the 2008–2011 working programme, Agroscope will conduct multidisciplinary research programmes in the fields of competitive crop farming systems in lowland regions (ProfiCrops), product quality and product safety, health and nutrition (NutriScope), and development, implementation and monitoring of promising production systems in mountain regions (AgriMontana).

Characteristic features of the research programmes are the limited duration with clearly defined targets, the interdisciplinary orientation, and co-operation with stakeholders, who will directly use and apply the research results. Transfer of knowledge and know-how is therefore an essential part of Agroscope research programmes. The programmes are briefly introduced below.



Launching of research programmes

Three focal points: nutrition, field crops/ special crops, mountain areas

Characteristics of Agroscope research programmes

**Fig. 4. Schematic representation of the network structure of the three research programmes.**

**ProfiCrops – New ways of ensuring a future for crop farming in Switzerland under liberalized market conditions**

**Starting position**

A further fall in producer prices has to be expected as a result of WTO negotiations and other bilateral agreements with the EU as well as agricultural free trade and free trade agreements with other countries. Lower production costs abroad, low transport costs, which do not offset the difference in production costs between home and abroad, and a continual loss of fertile land for cultivation mean that the cultivation of field and special crops is becoming less profitable in Switzerland and is dependent on innovations.

It is also important to take advantage of the change in behaviour of consumers in increasingly preferring low price products for daily consumption and selected high price products for enjoyment. Apart from quality and product performance, safety, health and fitness aspects of foods are also becoming more important. Last but not least, ever more diverse and differentiated marketing channels are posing new challenges for producers.

**State of research**

Cultivation of field and special crops in Switzerland is becoming less profitable

Customer demands and marketing channels are changing

Adaptation to more liberal markets continues

Positive development in ecological services provided by agriculture

Swiss agriculture is not alone in finding more liberal markets a major challenge. Innovations in the production chain as well as processes for increasing concentration and efficiency, which are necessary for Swiss crop farming, also characterize developments in neighbouring European countries. Their programmes are also aimed at making crop farming more competitive. Furthermore, the aim is to make production more sustainable by reducing emissions. Studies are being carried out, which are providing Agroscope with valuable new findings regarding methodology. However, results from abroad can only be partially adopted because of the different national framework conditions<sup>32</sup> which apply to crop farming. This means that, for example, differences in structures and in labour and energy costs have to be taken into account for economic analyses.

Low-cost production of high quality, yet moderately priced products ...

Swiss agricultural research studies are devoted to sustainable agriculture and therefore cover questions relating to both Integrated Production and organic farming. Due to the success of agricultural research, it has been possible to make very positive developments in crop farming including in the area of ecological services. These standards should be maintained with improvements in economic sustainability too.

### **Aim**

... by means of innovations in selection, cultivation, processing, disposal and optimization of economic structures

If crop farming is to continue to have a future in Switzerland, it is most likely to be with high quality, safe and moderately priced products. These must be produced at low cost and with due regard to the environmental standards expected by society. Increasing market segmentation and differentiation of marketing channels require a differentiated approach e.g. according to types of crop, consumer groups and production sites.

ProfiCrops sets itself the aim of ensuring a future for Swiss crop farming in a mainly liberalized market and of strengthening consumer confidence in domestic products. This is to be achieved by creating innovations<sup>33</sup> in the production chain from selection through cultivation to processing and disposal. Basic information for optimizing economic structures and farm management is also developed and the general public made more aware of the value of Swiss crop farming. The economic and technical framework conditions of crop farming are analyzed and proposals for optimizing existing potential put forward on the basis of this. In addition, applied studies are carried out, which are intended to clarify the conditions under which types of crops and sites are suitable for the framework conditions in question and foreseeable developments.

Early recognition and exploitation of opportunities for agriculture

### **Benefit**

In conjunction with partners, innovative products with high added value will be produced along the whole added value chain, new technologies will be developed and new business management findings made available. In this way ProfiCrops will help with the early recognition and exploitation of opportunities for agriculture arising from future free trade. ProfiCrops promotes interdisciplinary co-operation between the Agroscope research stations and external partners. At the same time, targeted inclusion of stakeholders makes transdisciplinary action possible.

Increasing health and safety awareness as a result of poor diet ...

## **NutriScope – Healthy, safe and high quality food of Swiss origin**

### **Starting position**

Human nutrition is an important social, economic and political subject: food scares, problems resulting from poor diet and food-related illnesses prove this. In Switzerland,

<sup>32</sup> Framework conditions is understood to mean political, economic, structural and natural (e.g. climate, topography, soil) conditions.

<sup>33</sup> The term "innovation" is understood in a broad sense, which means that e.g. it also includes improvements or further developments of processes and process stages.

costs resulting from obesity and related illnesses alone amount to between two and three billion Swiss francs a year. It is generally accepted that maintenance of good health is based on a balanced, healthy diet in accordance with the recommendations of the revised food pyramid<sup>34</sup>. This needs high quality, safe and healthy products which the agricultural sector can provide. These products contain a variety of substances and substance groups, which promise to have a positive effect on human health.

... and food scares

In recent years, food scares have repeatedly led to critical reports in the media and have subsequently undermined consumer confidence. They have affected both plant and animal foods. Questions about the quality and safety of end products and about residues and contamination of animal and plant foods are therefore growing more important. Early recognition and risk assessment are becoming important tools along the whole chain from production to trade.

Still little research into the effect of food on health...

### **State of research**

It is noticeable that international research publishes a large amount of material. However, the results are not always consistent and in the case of a fairly large number of studies, their independence is questionable. It is also striking that there are only relatively few studies in which the effect of a food or ingredient on health could be proven beyond doubt with an intervention study.

... but food research growing in importance

Swiss food research is of high quality. However, there is not always sufficient reference to Switzerland. There are gaps, particularly in representative surveys on nutrition. Moreover, due to limited resources, Swiss food research has little impact in terms of volume. This could change because hospitals are also becoming more involved in food research. The importance of diet in the healing process is becoming more widely recognized, but there are still large gaps in putting it into practice.

Promoting production of healthy foods of safe quality

### **Aims**

NutriScope sets itself the aim of optimizing parameters which determine quality, safety and health along the food chain from cultivation to the ready-to-eat product, in order to offer consumers maximum added value. In this way, health-promoting effects are to be optimized and the system of risk assessment reinforced all along the food chain. The existing safety plans (HACCP)<sup>35</sup> are being developed further, thereby safeguarding the competitiveness of Swiss foods, without prejudicing their high quality. Other aims of NutriScope are to work out possible ways and strategies for promoting more sustainable nutrition and to prove scientifically whether and in what situations it is better to take micronutrients in the form of natural foods or in the form of supplements.

High confidence in Swiss foods

### **Benefit**

NutriScope wants to make a major contribution to promoting a healthy diet and thus a healthy population, thereby reducing diet-related health costs. NutriScope also wants to strengthen the national and international competitiveness of foods of Swiss origin, increase the confidence of Swiss consumers in the food chain and ensure that Swiss foods are bought at home and abroad. These are basic prerequisites for achieving the aims of Swiss

<sup>34</sup> The food pyramid represents a balanced mixed diet, which ensures a sufficient supply of energy and of vital nutrients and protective substances and makes a significant contribution towards well-being. Foods in the lower levels of the pyramid should be eaten in larger amounts and those in the upper ones in smaller amounts. All foods are permitted. The important thing is that the foods chosen from the individual pyramid levels are as varied as possible and preferably in season, and are carefully processed and prepared. <http://www.sge-ssn.ch>

<sup>35</sup> HACCP: Hazard Analysis Critical Control Point. System of hazard analysis and definition of critical control points for controlling microbiological hazards and ensuring quality in the field of food processing.

agricultural policy.

Functions of the mountain region

**AgriMontana – agriculture’s contribution towards sustainable development of the mountain region**

Local disadvantages and falling economic importance in the mountain region

**Starting position**

The mountain region is first and foremost economic area and living space for the local population. For the rest of society, however, its main function is space for rest and recreation as well as cultural and natural area.

Economic possibilities in the mountain region are limited by local topographical, structural and climate disadvantages. Due to these local disadvantages, agriculture and forestry in the mountain region are increasingly running into difficulty, which will further reduce their economic importance in future. Linked to this are structural and social problems as well as the danger of non-sustainable development of the mountain area. Alongside the change in economic policy framework conditions, changes in social requirements are leading to a shift in internal and external demands placed on the mountain region.

No consistent strategies or action principles

**State of research**

In recent years, a number of scientific projects have tackled specific problems of the mountain region. A variety of disciplinary projects have obtained results relating to the agricultural and forestry system as well as to land use and production systems in the mountain region. On the basis of individual disciplinary projects, interdisciplinary projects carried out have shown the dependence of agriculture on past structural development, and also the trade-offs between the dimensions of sustainability of existing and new land use systems. In the majority of these projects the results were not carried over into consistent strategies for the mountain region. There was also failure to implement the strategies by involving local players. Moreover, with a sectoral focus on agriculture, the studies did not include the whole spectrum of development potential of the mountain region. The AgriMontana programme addresses these points by drawing up consistent strategies and action principles and by monitoring their implementation in at least one specific region.

To assess the economic, social and ecological impact of different land use systems

**Aim**

In order to ensure sustainable land use and shaping of mountain areas, AgriMontana has set itself the aim of drawing up action principles and policy measures as well as decision-making tools based on them for regional players and government. To do this, the economic, social and ecological impact of different land uses including the changing framework conditions and structures are to be studied and assessed. AgriMontana is to monitor concrete implementation of the strategies developed in conjunction with players in the study regions and record the impact with a monitoring system.

Knowledge for implementation and transfer for sustainable development of the mountain region

**Benefit**

AgriMontana is designed as an inter- and transdisciplinary research programme and is oriented towards joint synthesis. In terms of policy advice, the programme therefore contributes towards creating a co-ordinated regional and sectoral policy. Integrating the disciplinary projects into an inter- and transdisciplinary network makes it possible to obtain knowledge for implementation and transfer for sustainable development of the mountain region.

Information platform ProfitLait

**ProfitLait – for competitive milk production in Switzerland**

Alongside the three actual research programmes, the information platform ProfitLait

will be continued in the period 2008–2011. ProfiLait has set itself the aim of expanding the network of players in the field of milk production and of providing up-to-date information from practice, research and advisory services for the greatest possible benefit of practitioners. Agroscope is an important partner in ProfiLait with regard to the provision of research results. With its focus on milk production, ProfiLait, together with the three research programmes ProfiCrops, Nutriscope and AgriMontana, rounds off Agroscope's core skills and activities.



## 8. Bases for the management of Agroscope

### **NPM – New Public Management**

Entrepreneurial scope

As part of government and administration reform, the Swiss Federal Council decided that Agroscope should be managed under “new public management” [with performance contract and global budget] (NPM)<sup>36</sup>. NPM is intended to give Agroscope entrepreneurial scope.

### **Agricultural Research Council**

Recommendations on agricultural research ...

The Federal Department of Economic Affairs (FDEA) appoints a permanent Agricultural Research Council (ARC) of not more than eleven members in which interested parties are suitably represented. The ARC makes recommendations to the Federal Office for Agriculture (FOAG) on agricultural research, specifically on its long-term planning.<sup>37</sup>

... and evaluation of measures introduced

In particular the ARC draws up recommendations on the strategic orientation of research. It takes account of the policy aims of the Federal Council with regard to agriculture, research, environment and society. Periodically it evaluates the effectiveness of the measures introduced and if necessary suggests corrective measures.

### **Monitoring groups of experts and forums**

Incorporating the research needs of practitioners and publicising the services of the research stations

From a technical viewpoint, the research stations are monitored by expert committees (Monitoring Groups of Experts, MGE). These are made up of the most important customer groups. The MGE support the research stations in listing practical problems to be solved and in identifying the research needs of practitioners. Furthermore, the members of the MGE are also tasked with publicising the services of the research stations in their circles.

Promoting contacts

The research stations can also use forums each of which covers the areas of interest of one or more research stations. Forums are intended to help to promote contact with interested circles.

<sup>36</sup> BRB «Regierungs- und Verwaltungsreform» [Government and Administration Reform] of 25 February 1998 and BRB «Leistungsauftrag Geschäftseinheit Landwirtschaftliche Forschung im Bundesamt für Landwirtschaft betreffend die Jahre 2000–03» [Performance contract for agricultural research business unit in the Federal Office for Agriculture relating to the period 2000–03] of 24 March 1999.

<sup>37</sup> LwG, SR 910.1, Art. 117.

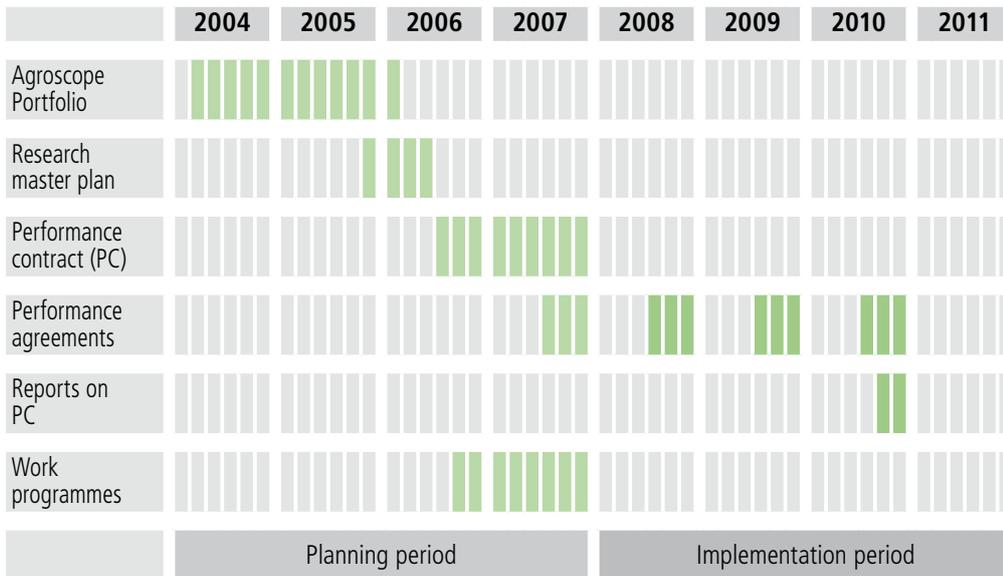


## 9. Planning and reporting

### Timetable

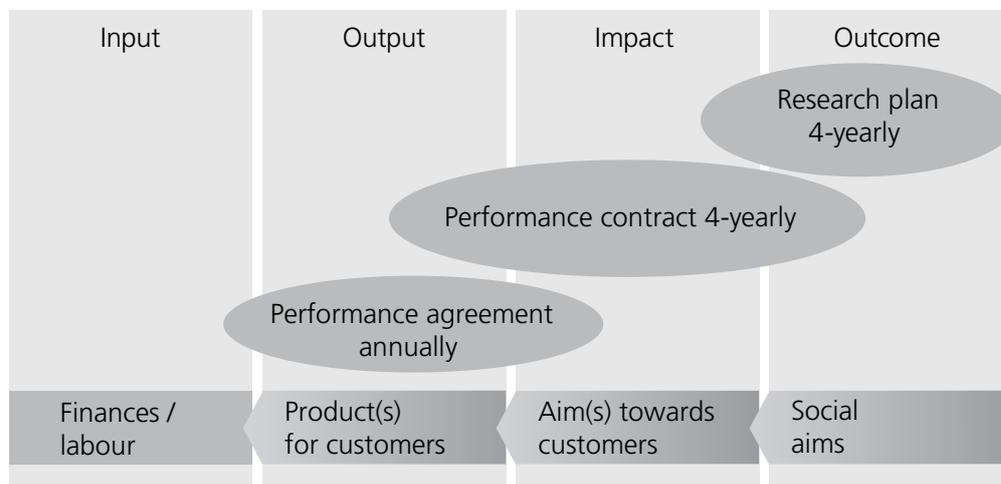
The timetable for planning Agroscope's research for the period 2008–2011 according to the objectives of NPM is as follows:

Planning



**Individual processes<sup>38</sup>**  
 Processes The processes in Agroscope are organized according to the integrated performance and effect control model (ILW-model) described in NPM.

**Integrated performance and effect control model (ILW) to support NPM**



**Research master plan**  
 Outcome level The highest socially relevant aims for Agroscope are set out in the research master plan.

**Performance contract**  
 Impact level The performance contract is awarded to Agroscope by the Federal Council, after consultation with the responsible parliamentary committee, for a period of four years. This contract sets out four-year aims with indicators and standards together with the global budget for the corresponding period. The four-year aims of the performance contract refer directly to the strategic aims of the research master plan according to the integrated performance and effect control (ILW) approach.

**Performance agreements**  
 Output level Performance agreements are drawn up with individual research stations by the FDEA [Federal Department of Economic Affairs] or the FOAG [Federal Office for Agriculture] for a period of one year each. The annual aims with indicators and standards together with the annual budgets for the products and part products are set out there. The annual aims contained there are oriented towards the four-year aims of the performance contract.

**Work programmes**  
 Input level For the work programmes, Agroscope primarily collects ideas and suggestions from all interested parties. Research projects are drawn up from these in conjunction with the monitoring group of experts [MGE] and relevant customers. These are documented in detail by Agroscope and entered into the ARAMIS<sup>39</sup> database. The information is available on the Internet for anyone interested.

<sup>38</sup> A detailed description of the individual processes can be found at: [http://www.flag.admin.ch/d/leitfaden\\_d/index\\_leitfaden\\_d.html](http://www.flag.admin.ch/d/leitfaden_d/index_leitfaden_d.html)

<sup>39</sup> [www.aramis.admin.ch](http://www.aramis.admin.ch)

### **Reporting**

Every year Agroscope reports on the achievement / non-achievement of the aims corresponding to the objectives of the annual performance agreement. At the end of the third year of the four-year NPM period, Agroscope reports on the attained level of the standards set out in the performance contract. Reporting is carried out for the attention of parliament and Federal Council.

Checking achievement of aims



## 10. Success stories of the three Agroscope research stations

Research master plans act as a planning instrument and signpost. Successful research requires logical pursuit of an aim and continuous incorporation of current knowledge and innovative methods. There is often a long road to travel from the idea of a product to its useful application in practice. The following three success stories report on this:

### **Gamaret in the ascendant – selection of new red grape varieties at Agroscope Changins-Wädenswil ACW**

In the sixties, the research station Agroscope Changins-Wädenswil ACW started a programme for selecting new grape varieties by hybridising European varieties. Initially the main idea was to increase the range of white grape varieties by searching for more aromatic varieties than Chasselas. Only the two white wine varieties Charmont and Doral, both crosses from Chasselas and Chardonnay, were suggested in practice.

The programme later focussed on the selection of new red grape varieties with the aim of producing well structured wines, which are rich in anthocyanins and good tannins; this was 30 years before blending of Swiss wines with foreign red wines was prohibited.

André Jaquinet, who was responsible for vine selection at the time, had a very skillful touch. The most cultivated new grape varieties are now: Gamaret, Garanoir and Diolinoir, which were selected at that time. Since the year 2000, Gamaret has been the most frequently planted vine variety in Switzerland. At the end of 2005 the area covered was over 300 ha. Garanoir and Diolinoir together cover 250 ha. Interest in the latest new selection, which is called Galotta and has a rich colour, currently exceeds propagating capabilities. These grape varieties were originally intended for production of blended wines or wine mixtures. Today they are also very successful as varietal wines, which are often finished in oak barrels.

## **ALP research improves the quality of Emmental cheese**

The typical eye formation in Emmental cheese is the result of propionic acid fermentation, in which lactic acid is fermented to propionic acid, acetic acid and carbon dioxide. Until well into the nineties, the most feared defect in Emmental cheese was secondary fermentation. In secondary fermentation, propionic acid fermentation resumes during the ripening process; the cheeses become cracked, break apart during cutting and are too high for pre-packaging. They are therefore demoted to class 2 (precooked cheese) for taxation.

In the seventies, the significance of controlled lactic acid fermentation was recognised; for this purpose, starter cultures were introduced at the then Federal Dairy Research Station FAM (now: Agroscope Liebefeld-Posieux ALP). In the eighties, cultures of heterofermentative lactobacilli were introduced, which inhibit the resumption of propionic acid fermentation. Finally in the nineties came the actual breakthrough. It became possible to isolate propionic acid bacteria from Gruyère and Appenzeller cheese, resulting in slower, controlled propionic acid fermentation in Emmental cheese. Today Emmental producers have a choice of two slow fermentation cultures (Prop 96 and 97) and one rapid fermentation culture (Prop 01) in ALP's range of cultures.

With an assumed period of 5 years and annual expenditure of 4 million francs, the research costs to develop the propionic acid bacteria cultures amounted to around 20 million francs. The introduction of this innovation led to an estimated reduction from 10 % to less than 1 % in the number of cheeses affected by secondary fermentation and thereby increased the annual additional proceeds from Emmental cheese by about 15 million francs. Payback for the research investment is consequently about 16 months.

### **Pioneer work by ART in fodder crops – setting a trend for Europe too**

In the second half of the 20th century, it was possible to optimise the use of grasses, clover and herbaceous plants for feeding farm animals. In Switzerland, pasture with a defined proportion of clover and herbaceous plants is still the most important component in the feed ration of ruminants. This is in complete contrast to the rest of Europe where in recent decades fodder crops have moved in the direction of single grass crops and high proportions of concentrated feed in the ration due to cheap mineral nitrogen fertilisers and low prices for concentrates.

Swiss agricultural research on the other hand has put fodder plant selection and clover-grass mixtures firmly on the map over the last 50 years. In this area, ART can now draw on a fund of knowledge which is without parallel. There are currently 70 Swiss cultivars of eleven species in more than 16 countries on the official list of varieties. Over 50 Swiss varieties are listed in the European Union's catalogue of varieties, and almost as many are recommended for cultivation in Switzerland. The range of sown meadow mixtures developed by the research stations stretches from those for maximum yield and best quality fodder to those for sowing species-rich wild flower meadows for ecological compensation. Our research recognised and further developed this multifunctional service of grassland. Furthermore, the ecological and economic aspects of fodder crops were harmonized under the prevailing political framework conditions.

Current efforts in the international arena confirm that consistent optimisation of environmentally compatible fodder crops and a high proportion of grass and clover in the feed ration of dairy cows are still setting the trend. Since the BSE crisis more efforts are being made in this direction throughout Europe (e.g. by increasing the clover percentage in grassland). Swiss know-how developed over many years is now being incorporated in European projects by scientists at ART. Apart from food safety (traceability of the fodder), our system allows closed nutrient cycles and is therefore the keystone of environmentally favourable food production. To this extent Switzerland can in future take a leading role internationally in establishing modern fodder crops.



## Annex

**Annex 1:****Key figures for Agroscope 2005**

Parameters	Unit	Agroscope
Net financial requirement	million CHF	112.6
Percentage of staff remuneration in total expenditure	%	62.9
Acquisition of outside funding research	million CHF	11.2
Publications	number	1,497
• of which scientific publications	number	580
• of which practice-oriented publications	number	714
• of which internal administrative reports	number	71
• of which press releases	number	132
Lectures	number	1,503
Teaching	lessons	1,721
Co-operative projects	number	298
Staff numbers budget funds	full-time posts	721
• of which percentage of women	%	28.8

**Financial resources for Agroscope<sup>40</sup>**

	2005	2006	2007	2008	2009	2010	2011	2012
Net financial requirement <sup>41</sup> Agroscope (in million francs)	113	105	97	96	98	99	99	99

<sup>40</sup> 2007 according to estimate, 2008–2010 according to financial plan, 2011 and 2012 provisional figures (incl. enforcement tasks).

<sup>41</sup> Net financial requirement = total expenditure – total revenue.





Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Swiss Confederation

**Agroscope Changins-Wädenswil Research Station ACW**

**Agroscope Liebefeld-Posieux Research Station ALP**

**Agroscope Reckenholz-Tänikon Research Station ART**