

## **Paper for the World Lake Vision Action Report**

### **This case study refers to Principle 5 of the World Lake Vision:**

The management of lakes for their sustainable use requires the resolution of conflicts among competing users of lake resources, taking into account the needs of present and future generations and of nature.

### **Title: Sustainable Agriculture at Lake Constance (Austria, Switzerland, Germany)**

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**300-word** Abstract and approximately 4-6 keywords.

This case study refers to **Principle 5** of the World Lake Vision. Lake Constance lies just to the north of the Alps at 395 m above sea level. It has a surface area of 571.5 km<sup>2</sup>, is 254 m deep and has a volume of 48.5 km<sup>3</sup>. As a natural ecosystem, Lake Constance is a representative and significant natural habitat for plants and animals in Central Europe.

About 433,000 hectares of the Lake Constance area are being used for **agriculture**. It is the biggest cultivation area for pomaceous fruit in Germany. Agricultural concentration process particularly of full time farmers has led to a significant increase in acreage. Nevertheless agricultural industry is still characterised by rather small and middle-sized farms compared to international conditions. All economical uses in the catchment area of the lake need to be harmonized with the important role of Lake Constance as drinking water reservoir. The supply of drinking water to 320 towns and communities with a total of approximately 4 million inhabitants is a significant social and economic factor in the area.

After decades of agricultural intensification a tendency to **extensification** of the agricultural use can be observed in the last few years. National extensification and agro-environmental programmes contribute to motivate farmers to make ecological efforts which are compensated through performance related premium payment. The extensively cultivated area i.e. –synthetic chemical fertilizers and herbicides are used very restrictedly only – increases continuously and currently amounts to 16 %. In 2003, in Vorarlberg, nearly 75% of the land was extensively cultivated, in other abutter regions and cantons their share was between 10 and 15 %. About 8% of the agriculturally used area is cultivated according to **organic farming** methods. The **marketing** of regional organic and environmentally sound food shall be improved by the development of regional business structures and the creation of new outlets. For this purpose, new alliances and co-operations between agriculture, trade, distribution and commerce as well as tourism are necessary.

### **Introduction (background information about the lake);**

Lake Constance lies just to the north of the Alps at 395 m above sea level. It has a surface area of 571.5 km<sup>2</sup>, is 254 m deep and has a volume of 48.5 km<sup>3</sup>. As a natural ecosystem, Lake Constance is a representative and significant natural habitat for plants and animals in Central Europe. Nature preserves such as the Wollmatinger Ried and Vorarlberg's Rhine delta enjoy international prominence.

Lake Constance has German, Austrian and Swiss shorelines. The Principality of Liechtenstein is also located in the lake region. This international settlement and industrial region is inhabited by over 3 million people. Over 500 people per square kilometre live along the shoreline of the lake. It is the second largest pre-alpine European lake by area and volume after Lake Geneva. The lake basin is situated in the Molasse basin of the northern Alpine foreland and was mainly formed by water and ice activity during the last Quaternary glaciation period more than 15.000 years before present. The catchment area of Lake

Constance is about 11.500 km<sup>2</sup> and covers the territories of three European countries: Germany (28%), Switzerland with Liechtenstein (48 %) and Austria (24%). Lake Constance is traditionally divided into Lower Lake Constance and Upper Lake Constance. More than 90% of the water flow originates from the Alps by the three inflows Alpenrhein, Bregenzerrach and Dornbirnerach in the eastern part of the Upper Lake.

As a natural ecosystem, Lake Constance is one of the most representative and important wetland habitats for plants and animals in Central Europe. Lake Constance has particular significance as a resting and wintering area for ca. 250,000 water birds and is the most important inland body of water for water fowl in Germany, Switzerland and Austria. Of European importance is the high number of water fowl – in autumn and winter – as follows: (maximum values/day of the bird censuses): Great Crested Grebe *Podiceps cristatus* (12,700 individuals), Gadwall *Anas strepera* (12,600), Red-crested Pochard *Netta rufina* (20,400), Pochard *Aythya ferina* (80,000), Tufted Duck *Aythya fuligula* (116,000), Coot *Fulica atra* (77,600).

The occurrence of more than 350 bird species in Central Europe is only possible in a region of favourable geographical position; especially the location of the lake at the northern edge of the Alps favours the occurrence of numerous migratory birds. Some Alpine birds such as Wallcreeper *Tichodroma muraria* and Crag Martin *Ptyonoprogne rupestris* breed in the Lake Constance region or are guests such as Golden Eagle *Aquila chrysaetos*, Alpine Accentor *Prunella collaris* and Ring Ouzel *Turdus torquatus*. Contrary to other large lakes at the foothills of the Alps the water level of Lake Constance is not regulated artificially. Plant species of the lake shore are especially well adapted to the natural change of two meters in average between the winter low water and the summer high water level. On gravelly soil grow the endemic Lake Constance Myosotis *rehsteineri*, in society with *Deschampsia littoralis*, Shoreweed (*Littorella uniflora*) and Creeping Spearwort (*Ranunculus reptans*).

### **Issues and problems facing the lake**

The greatest challenge in the area of land development facing the international region is the necessity to stop all further settlement of the landscape and constructions on all available spaces. Settlement planning must be based to a greater extent than today on responsible land and soil usage. The shore regions with over 500 inhabitants per km<sup>2</sup> are among the most densely settled areas. The amount of settled and paved areas is more than twice as high in the shoreline communities than in those in the “second row”, representing 14% or more of the zoned land. In terms of transportation, the Lake Constance region has one of the highest concentration of streets and traffic in rural areas of Germany. In addition to the settlements and the transportation infrastructure, there are also recreational facilities, bank fortifications and excavations for sand and gravel. Today, 42% of the Lake Constance shoreline in Baden-Württemberg is built up with quays or walled embankments.

The part of the Lake Constance landscape which traditionally was cultivated in a natural way is even today dominated by agriculture. Land-use and landscape management are characteristic in 47 % of the catchment area. The particular natural conditions (climatic, geological, soil related) have created a diverse and regionally differentiated land use with unique landscape patterns. About 433,000 hectares of the Lake Constance area are being used for agriculture. Most land used are green fields and pasture land which make up 76% (330,000 ha). Crops are grown on 16.4% (71,000 ha) and 6.9% (30,000 ha) is taken up by so called special cultures. In order of importance these are: fruit plantations, hop, vegetables, and vines. The grassland portion eastward and on the Southern side of the lake towards the inclining hill land is increasing considerably. Agricultural use increases in the western direction. In the plain areas bordering the Rhine and Lake Constance intensive cultivation (farming, horticulture) is predominant. Close to the shore, with the exception of the eastern part of Lake Constance, specialist cultivations i.e. fruit farming, viticulture and hop farming are prevalent. Lake Constance is the biggest cultivation area for pomaceous fruit in Germany. Its cultivation increased by 10 % during the past 10 years (compared to a

decrease of 7 % in other tree fruit cultivations). Mainly apples are being cultivated. About 1,600 fruit growers cultivate about 7,400 hectares. Yearly about 220,000 tons pomaceous fruits are produced for the fruit trade. So 20 % of the pomaceous fruit production in Germany are coming from Lake Constance. 90 % of the land is cultivated according to integrated production, 5 % to organic farming principles.

Agricultural concentration process particularly of full time farmers has led to a significant increase in acreage. Nevertheless agricultural industry at Lake Constance is still characterised by rather small and middle-sized farms compared to international conditions. The total agriculturally used area was only reduced by 5% in the past two decades. The number of agricultural businesses around Lake Constance has been decreasing steadily in the past decades. Between 1979 and 1999 the number of businesses for which farming was the main income has almost halved, while farming as a second-income source has dropped by 20%. Currently there are still approximately 24.000 farms in the lake Constance region. The competition among farms has led to an overall increase in farm size. In 1979, 66 % of all farms were smaller than 20 ha, but by 1999 only 38 % were smaller than 20 ha. The average size of a farm is currently 17.8 ha.

Important cost pressure and the structural change in agriculture lead to increased abandonment of so-called non-economic areas (particularly grassland and scattered orchards). Often these locations are ecologically very interesting sites. The protected habitat complexes (core areas) of numerous threatened grassland species need additional extensive utilisation zones. Currently there is no preventive area management to establish larger units of areas and extensive pastures. Otherwise the consequence will be considerable and dramatic loss of typical and valuable landscape structures as well as animal and plant species. The uncontrolled changes in the cultural landscape would also negatively affect tourism.

Also the scattered orchards, which are typical for the Lake Constance region, are severely threatened. Here the structural change becomes clearly noticeable. Many trees are too old, newly planted trees lack competent care, young farmers due to the bad economic general conditions are not motivated to continue take care and develop the mostly unprofitable orchard areas.

All economical uses in the catchment area of the lake need to be harmonized with the important role of Lake Constance as drinking water reservoir. The supply of drinking water to 320 towns and communities with a total of approximately 4 million inhabitants is a significant social and economic factor in the area. Ensuring the quality of drinking water is the central challenge in the region: from  $<10 \text{ mg/m}^3$  in the 1950s, the total phosphor content of the lake water rose to  $87 \text{ mg/m}^3$  in 1979. Thanks to international cooperation and investments totalling over six billion Swiss francs for construction and modernization of sewage canals and 220 water treatment plants, the phosphor level was able to be reduced to  $12 \text{ mg/m}^3$  in 2002.

### **Strategies and actions taken, and their outcomes; also describe strategies/actions in relation to WLV principles;**

After decades of agricultural intensification a tendency to extensification of the agricultural use can be observed in the last few years. National extensification and agro-environmental programmes contribute to motivate farmers to make ecological efforts which are compensated through performance related premium payment. The extensively cultivated area i.e. –synthetic chemical fertilizers and herbicides are used very restrictedly only – increases continuously and currently amounts to 16 %. In 2003, in Vorarlberg, nearly 75% of the land was extensively cultivated, in other abutter regions and cantons their share was between 10 and 15 %. About 8% of the agriculturally used area is cultivated according to organic farming methods. .

An integrative development programme for the Lake Constance region has been introduced. The regional and cantonal administrative authorities are responsible for the relevant programmes ELR (Development Programme for Rural Areas) and UBR (Environmental Programme for the Lake Constance Area). The main focus of the activities of the various projects in the Lake Constance region which aim to foster sustainable agriculture are:

- promotion of the regional marketing of foodstuffs produced using environmentally sound farming methods via short distribution channels (with the aim of linking indigenous cultivated areas, agricultural produce and consumer behaviour patterns)
- ecological farming suited to the location e.g. the preservation of the ecologically valuable scattered orchards which are typical of the region
- linking and extensification of biotopes (with the aim of connecting and preserving extensive areas for wild flora and fauna)
- safeguarding the livelihood of rural farms and preserving the diverse cultivated and recreational areas by e.g. introducing and sensitising tourists to rural farming and the preservation of cultivated and recreational areas (with the aim of finding new “allies” in the fields of gastronomy, health resorts, hotels, canteens etc.)

The marketing of regional organic and environmentally sound food shall be improved by the development of regional business structures and the creation of new outlets. For this purpose, new alliances and co-operations between agriculture, trade, distribution and commerce as well as tourism are necessary. The idea behind the project „Gutes vom See“ (Good regional dishes) was to develop the infrastructure for the supply of canteen kitchens and gastronomy with regional and regional ecologically produced food. On the one hand this should contribute to increased marketing of regional environmentally friendly produced food, on the other hand regional economic cycles should be developed and strengthened.

Meanwhile over 60 producers, processing enterprises, retailers, gastronomes and canteen chefs are organised in the association „Gutes vom See“ and have developed a common label. The homonymous logo – Gutes vom See – stands for guaranteed environmentally friendly produced regional food from the Lake Constance region. The organisation strives to promote sustainable development in the Lake Constance region on the basis of close inter-branch co-operation. Up to now this kind of co-operation and mutual promotion is unique in Germany. The importance of this strong community for the economic area can be deduced from the number of apprenticeship training positions and jobs these companies provide (over 1700 jobs and over 120 apprenticeship training positions).

In 2006 for the first time a competition „Conservation achievements of agriculture“ was carried out in the district of Constance. Agricultural enterprises contribute a lot to the protection of nature. Often these achievements are not known to the public and therefore not recognised. 40 farmers participated in the competition and filled out the questionnaire. An interdisciplinary jury visited selected farms, and 8 prize winners were awarded in the frame of a public presentation. Currently the competition results as well as the good collaboration between the actors from agriculture and nature protection are used to better meet the demand for information and consultation of farmers and to develop appropriate modules for more conservation in agriculture. Parallel media are contacted, competition results published, and the participants introduced.

#### **Outcomes of management activities; Lessons learned, including:**

- \*How to effectively apply/operate WLV principles?**
- \*How to translate the WLV principles into actions?**

A clear public statement from the states along Lake Constance that organic farming represents the method which most adequately preserves natural resources and therefore receives particular state support (through state-funded advertising and the use of regional organically-grown foods in the canteens of public institutions such as offices, universities, etc.) is necessary.

Ecological minimal standards must be maintained when compensation payments are made to farmers: a maximal occupation level of 1.5 large cattle unit per ha and a 10% level of compensatory organically maintained land from the total surface are in the form of hedges, natural borders. The introduction of internationally valid high ecological and social standards for the production and sale of agricultural products is necessary.

The marketing of regional organic food shall be improved by the development of regional business structures and the creation of new outlets. For this purpose, new alliances and co-operations between agriculture, trade, distribution and commerce as well as tourism are necessary. Consumers (including holiday-makers) should get informed by information facilities and offers about the connection between environmentally sound agriculture, healthy food, preservation of cultural landscape and nature protection.

### **Key lessons of relevance for other lake regions**

At Lake Constance as in other areas alike agricultural subsidies are socially accepted only when performance-related. A possibility to justify subsidies is to reward ecological achievements in agriculture. MEA, a Baden-Wurttemberg agro-environment programme is a good political example based on voluntary participation and providing economic incentive for the supply of ecological achievement. In order to motivate as many farmers as possible to participate in this programme, it is important to honour simple measures which are easy to realize. Pilot schemes are good, broad effect better!

The realisation of innovative pilot schemes is important to test new approaches and ideas and to further develop them. It is also important to draw the attention to such projects during the project run e.g. by effective PR work, as afterwards it is often rather difficult to realise approved project approaches with far reaching effects.

It turned out that the integration of women into the development and decision making progress is of great importance. Particularly in the rural regions women's energy and competence are extremely well developed and are an important endogen potential.

### Success factors of successful projects at Lake Constance

- Make coalition of winners
- Appropriate target-oriented project structures
- Disposability of resources and capacities
- Active environment management
- Flexibility, learning aptitude, willingness and capacity to compromise
- Process competence
- Winning of influential supporters
- Committed individuals
- Sustainable projects

### **The way forward, including future plans to further implement the WLV**

Lake Constance is drinking water reservoir for over 4 million people. The use of environmentally harmful chemical fertilizers and herbicides in agriculture and forestry must be minimized.

- § The promotion of environmentally sound area management suited to the location must be continued. In formulating promotional programmes the local and regional demands must be taken into consideration even more.



- § For all farmers in the Lake Constance region competent environmental advisory services must be guaranteed. Area-wide in the region demonstration model farms (for extensification and nature protection) are to be established.
- § Area-wide reduction of occupation level to the target value of 1.4 large cattle per unit and hectare in the Lake Constance region.
- § The scattered orchards, which are typical for the landscape, and valuable conservation areas are to be preserved and further developed. Especially marketing potentials for products from the orchards must be developed and competent care and preservation ensured

All farm animals at Lake Constance must be kept according to their particular requirements in a natural environment.

- § Information and advisory services to promote the keeping of animals in their natural environment must be intensified. Their implementation should be financed via special support programmes.
- § The implementation of measures for the keeping of animals in their natural environment must be financially supported by combined special support funds.

The existing extensification and landscape management programmes offer too little scope for design at regional and local level. The Baden-Württemberg support programme PLENUM is a path-breaking approach based on regional demands.

- § For an integrated and sustainable regional development around Lake Constance support instruments adapted to the regional conditions are necessary.

The ongoing structural change in agriculture threatens the sustainability of agriculture in the Lake Constance region. To ensure farming suited to the location and management of ecologically valuable areas following measures are necessary:

- § Regional management plans for agricultural areas
- § Conception and establishment of regional landscape conservation funds to financially ensure the implementation of management plans for agricultural areas

To efficiently and lastingly prevent contamination of economic plants and protected areas with genetically modified organisms following measures are useful:

- § In the whole Lake Constance genetically modified seed and fodder should not be used, and the Lake Constance region should become a genetic engineering free zone.
- § To develop marketing potentials for products free of genetic manipulation (GM) studies should be conducted and concrete projects and measures for the production, processing and marketing of GM free products carried out.

In the meantime organic farming has the most dynamic growth rate in the agricultural sector. Organic farming as the most sustainable cultivation system in the Lake Constance region should become standard for agriculture and horticulture.

- § Establishment of the bio-region Lake Constance to promote more intense networking and co-operation of all bio actors around Lake Constance.
- § Target until 2010: 20% organic farming in the Lake Constance region.
- § Development and organisation of marketing campaigns for regional organic food.

Also extensive and integrated agriculture contributes considerably to sustainable land use. The regional sale of environmentally sound produced food from the Lake Constance region should be increased significantly. Networking and intense cooperation between the actors and persons in charge of regional marketing around Lake Constance should be promoted.

- § Common actions and sensitization campaigns to promote regional environmentally sound produced food must be developed and carried out. The connection between consumer behaviour and climate protection should be pointed out.

With regard to the structural change in agriculture, in future, it will be more difficult for farmers to generate sufficient operating income exclusively via food production. Therefore basic conditions must be developed in time enabling farmers to earn additional money e.g. through additional businesses and alternative income sources such as generation of energy, energy use, tourism.

- § Establishment of support programmes to develop alternative income generation for agriculture
- § Realisation of model projects in the fields of energy generation/energy use and tourism.

## **Acknowledgements**

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**Tables:**

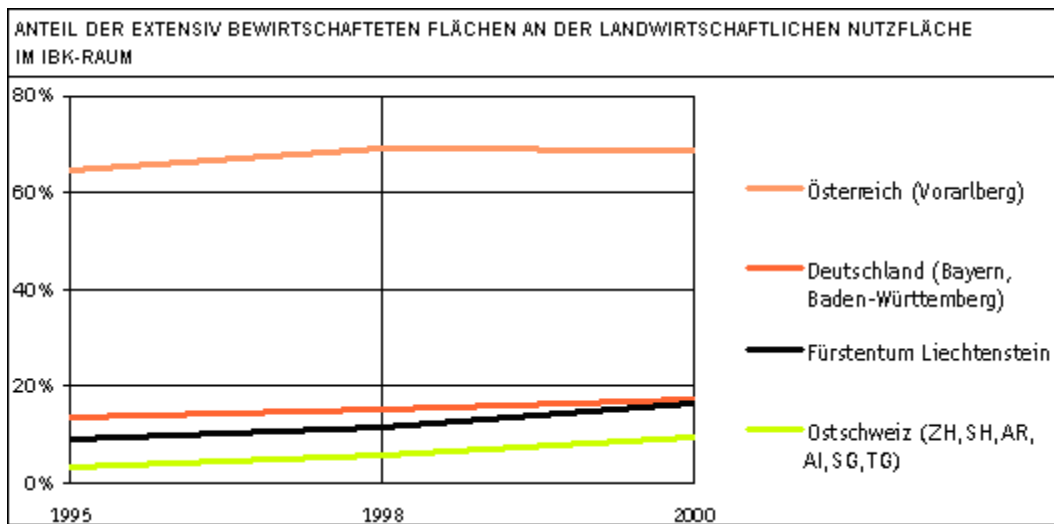
Morphometric data of Lake Constance (47°39'N, 9° 18'E) and its catchment area:

	Upper Lake	Lower Lake	Total
Altitude a.s.l (m) at middle water level	395.33	395.11	
Surface area of water (km <sup>2</sup> )	500	71.5	571.5
Volume (10 <sup>6</sup> m <sup>3</sup> )	47.678	0.808	48.486
Maximum depth (m)	253.3	46	
Mean depth (m)	101	13	85
Mean range of annual water level fluctuation (m)	1.50	1.48	
Length of shoreline (km)	186	87	273
Mean outflow (10 <sup>9</sup> m <sup>3</sup> /yr)	11.1	11.7	11.7
Residence time (yr.)	4.3	(0.07)	
Catchment areas (km <sup>2</sup> )	10919	568	11487

(d) **Figures:**

All illustrations (line drawings and photographs) are classified as figures, and should be cited in consecutive order in the text. All figures should be in black and white, rather than color.





Cultivated area in the international Lake Constance region (Austria, Germany, Liechtenberg, Switzerland)