OPTIMIZE / REDUCE OVERALL STOCKING RATES ON LIVESTOCK FARMS

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Description

The aim is to optimize overall stocking rates of agriculture within a sustainable nutrition system esp. in high income countries with respect to:

1. a healthy human nutrition esp. with animal food (consumption) and only a corresponding animal production (➔ Sufficiency) and
2. also therefore less overall environmental encumbrance like eutrophication, acidification and climate change as well as simultaneously conservation of the natural resources like water, (fossil) energy, mineral phosphorus etc. (➔Consistency) and
3. an adequate income for the livestock farmers with animal products not cheap but worth their prices both according to the social, environmental and economical needs (➔ Efficiency)

The European Commission launches public consultation of sustainable consumption and production and sustainable policy on 27 July, 2007 with the conclusion "Current pattern of consumption and production are leading to the rapid depletion or exhaustion of certain natural resources causing serious environmental degradation and pollution. The issue is a global one: Several studies and assessments suggest that the current consumption and production already significantly exceeds what the planet can support in the long term". This is also relevant for the nutrition system [4].

Applicability

Taking the situation in Germany as an example, **Tab. 1** shows the overwhelming contributions of the total system nutrition to the environmental encumbrance eutrophication, acidification, climate change and decline of biosphere as well to the threatening of human health. About 70-90% of the nutrition shares on environmental and health damages are caused in the high income countries by the excess of animal consumption and corresponding animal production. Oriented towards critical levels and loads of the natural near ecosystems there is a need of 60-80% reduction of the C, N, P, S emissions of the total nutrition system [5-14]. Additionally over nutrition (56% of the population in Germany) causes 48% (120 billion € · yr^{-1}) of the total illness costs of 250 billion € · yr^{-1} (=100%) and additionally 78% of untimely death. **(Tab. 2)[**3]. **Tab. 3** shows direction and likely extent of change in risk of health outcomes in response to future achievement (proposed by McMicheal et al. 2007 [15] for 2050) of a proposed international target of 90 g meat per day per person in all countries. Therefore the German Society for Human Nutrition [1-3] recommends an average net meat consumption of only 64g meat per person and day, but actual meat consumption in Germany is 168% higher corresponding to 286 g per person and day **(Tab. 4**). In **Tab. 5** the linkage is shown between sustainable and healthy human nutrition with animal food and corresponding needed sustainable animal production of agriculture. Accordingly only 0.1 AU (50 kg life weight) are needed per capita and correspondingly for Germany with 82.5 million capita an overall stocking rate of only 8.3 million AU instead of actually 18.5 million AU. Correspondingly within the EU-27 there is a need of an overall reduction of animal production of -64 (Ireland: -94 to Malta: -19)% and within Germany of -56 (Schleswig-Holstein: -79 to Rheinland-Pfalz-Saarland: +7%) **(Tab. 6)** [14**]**. This reduction of stocking rates must be done on those farms where the stocking densities are not tolerable with > 1 AU · ha^{-1} (see factsheet "optimize / reduce stocking density).

Effectiveness, including certainty

The effectiveness of the optimisation / reduction of overall stocking rates and livestock densities on livestock farms depends on the extent of implementation i.e. done by a tax levy model for animal products to relieve the environment and public health as shown in **Fig. 1**. The reduced income for the farmer should be compensated by corresponding higher prices for animal products with such a tax levy model. Generally sufficiency is a prerequisite for consistency and efficiency (Agenda 21 of Rio 1992): Sufficiency especially here in animal food and feed but also in bio energy consumption and the only corresponding production by agriculture leads especially in the "developed" and high income countries with their tremendous overnutrition to ca. 70 (±10)% of the above mentioned needed emission reductions of reactive C, P and S of the total nutrition system. This must be flanked by "only" 30 (± 10)% reductions by technical measures done by agriculture as well as additionally and continuously by waste and waste water management. Nutrient surpluses will decrease tremendously and nutrient as well as energy efficiency will be doubled. Other positive effects will be **(Fig.1)**:

- tremendous increase of public health by a healthier human nutrition with decreased diseases caused by over-nutrition and increased expectation of life;
- More food for the 3rd world;
- More agriculture area for the production of bioenergy, provided, it is sustainable both in respect to social, ecological and economical needs;
- Less suffering of animals;
- Less need of pharmaceuticals.

[13, 14]

Time frame

These reductions of overall stocking rates and stocking densities can be done immediately as was done after the collapse from 1989 in the CEE countries with a reduction of stocking rates of about -60% within only 3 years and consequently with a tremendous decrease of the emissions of reactive C, N and P from agriculture and corresponding less environmental encumbrance even without any lack of (animal) food [5-12]. In this way the contributions of the CEE countries both against eutrophication, acidification, decline of biosphere and climate change were worldwide the greatest ones, inclusive those of the nutrition system and agriculture

Environmental side – effects / pollution swapping

There are only positive and no negative side effects or pollution swapping from measures to optimize stocking densities on livestock farms and overall stocking rates. Stocking densities will affect emission densities which are important for the emissions and their effects of C_{org}, DOC, (in)organic N, P and S to hydrosphere as well as NO and NH_3 to atmosphere and pedosphere, but not for the emission and effects of the direct climate relevant gases CO_2, CH_4 and N_2O.

Relevance, potential for targeting, administrative handling, control

The option to optimize / reduce overall stocking rates is primarily relevant for livestock farms with stocking densities of > 1 $AU \cdot ha^{-1}$. Control both on stocking rates and stocking densities will be easy. The potential for targeting is generally high but depends on the actual stocking rates.

Costs: investment, labour

Both investments and labour costs will decrease tremendously. There is a huge win-win situation referring the public costs for decreased over-nutrition as well as corresponding illness costs e.g. in Germany with a potential of 140 Billion $€ \cdot yr^{-1}$ and for fewer environmental repairs **(Tab. 2, Fig. 1).** Referring to these 140 Billion € · yr^{-1}(100%) there are only needed about 10 Billion € · yr^{-1} or 7% to support the farmers to get those prices for their products that no subsidises are necessary neither from the EU nor from Germany itself.

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Tab. 1: Contribution of:

1. **the total system nutrition (agriculture with plant and animal production, human nutrition with plant and animal food consumption as well as waste and waste water management)**
2. **animal production and animal food consumption within the system nutrition**

to environmental changes / damages and threatening of human health in Germany

	% contribution	
	1. Total system nutrition	**2. Animal production and consumption within the system nutrition**
1. Eutrophication	**80**	**70**
2. Acidification	**40**	**90**
3. Climate change	**25**	**60- 80**
4. Decline of biosphere (also consequences of 1.-3.)	**80**	**70**
5. Threatening human health (Untimely death)	**78**	**80**

Re0931

Tab. 2: Shares of over-nutrition costs on total illness costs in Germany in 2007
(Not included: Additional costs of over- nutrition for environmental damages and needed resources caused by corresponding over-production of agriculture)

Illness costs	Billion € $\cdot$ yr^{-1}	€ $\cdot$ $capita^{-1}$ $\cdot$ yr^{-1} [82,5 $\cdot$ 10^{6} capita]	€ $\cdot$ $patient^{-1}$ $\cdot$ yr^{-1} [70,6 $\cdot$ 10^{6} patients]
A) Total costs	250 (100) (www.phmon.de)	3030	3541
…off them: Expenditures 1. by appropriate „health“ agencies	150 (60) (www.die-gesundheitsreform.de)	1820	2125
2. Overhead (health agencies, doctors, hospitals)	83 (33) (www.portaleco.com)	1006	1176
B) …off them caused by over nutrition (56% of population: 51% female, 61% male, 10% adipositas) (Ernährungsstudie 2008)	120 (48) (Rechkammer 2008, BFEL) [Additionally: 78% untimely death ➔ savings for pensions]	1455	1700

re0973

Tab. 3: McMichael et al. (2007)

	High-income countries	Low-income countries
Current approximate total meat consumption (g per day per person)	200–250	25–50
Change in		
Heart disease*	– – –	+
Stroke	No substantial effect	– – –
Colorectal cancer	– – –	++
Breast cancer	– –†	+
Childhood growth stunting	No substantial effect	– – – –
Overweight/obesity	– –	(+)

Risk shifts refer only to the effect of a change in meat consumption. Other associated dietary changes are not considered. *Attributable mainly to saturated fat content. †Less certain than for bowel cancer.

Table 3: Direction and likely extent of change in risk of health outcomes in response to future achievement (proposed for 2050) of a proposed international target of 90 g per day per person in all countries

re0888

Tab. 4: Average daily dietary intake of energy, nutritious matters and meat of males and females in Germany (1993) compared with the recommendations (reference values)
(Nutrition report DGE 2000)

Energy Nutritious matters Meat	Recommendation = Reference value [1)]	Actual Situation (1993) (n= 38 924)		Compare % Reference value 1985 / 89
		Units · capita^{-1}	% reference value	
Energy (kcal ·d $^{-1}$)	2025 (2079)	2295	**114**	99
Protein (g ·d $^{-1}$)	46,2 (49) (0,8 / kg weight)	76,6	**166**	**155**
Fat (g/d)	70	94,2	**136**	**127**
(% Energie)	30	36,3	**121**	**-**
Carbohydrates (g ·d $^{-1}$)	275	257	**94**	83
Dietary fibre (g ·d $^{-1}$)	(30)27,3	20,1	**74**	**65**
Meat (Net)				
1) German Cancer Aid (2000)[1)]				
a) (g ·d $^{-1}$)	80	172,1	**215**	**229**
b) kg ·a^{-1}	29,2	62,8		
2) German Nutrition Society (DGE 2000) [1)]				
a) (g ·d $^{-1}$)	64 (43-86)	172,1	**268**	**286**
b) (g ·w $^{-1}$) (6 meals x75g =)	450 (300-600)	1205		
c) kg ·a^{-1}	23,4 (15,7-31,4)	62,8		

Re0543

[1)] **German Cancer Aid and German Nutrition Society (DGE) : Ø = 72g/d = 504g/w = 26,3 kg/a**

Tab. 5: Linkage between sustainable and healthy human nutrition with animal food and corresponding needed sustainable animal production of agriculture exemplarily shown for Germany in 2000 (BMVEL 2001)

Animal food	**Sustainable / Healthy human nutrition**		**Corresponding needed animal production of agriculture with 0.1 AU· cap^{-1} = 50 kg life weight**
	Needed animal food (kg· cap^{-1} · yr^{-1})	**Milk equivalents (kg· cap^{-1} · yr^{-1})**	
Milk and milk products	**Milk: 45.6 (4.2% fat)** **Butter: 2.9 (80% fat)** **Cheese: 7.3** (i.e. Emmentaler: 8 kg cheese = 100 kg milk)	46 55 91 **Total: 192**	Milk cows: 1 AU = 6127 kg milk· yr^{-1} 32% of animal stock = 16 kg life weight with **196 kg milk· cap^{-1} · yr^{-1}**
Meat	**23.4**		50 kg life weight x 49% efficiency of meat yield **= 24.5 kg meat· cap^{-1} · yr^{-1}** **➔ Tab. 21**
Eggs	**3.7** **= 60 eggs with 62 g · egg^{-1}**		**60 eggs x 276 eggs· laying hen^{-1}· yr^{-1}** **= 0.22 laying hens· cap^{-1} · yr^{-1}**

Re0604

Tab. 6: Necessary reduction of animal production and livestock of agriculture
both in the countries of EU-25+2 and in the Federal lands of Germany
on the basis of the actual capita-specific animal densities ($AU \cdot capita^{-1}$)
in comparison with a maximum tolerable animal density of 0.1 AU= 50 kg life weight $\cdot$ capita^{-1} (Isermann 1995/2006)
according to a healthy human nutrition with animal food, especially with meat
[Net: max. 23,4 kg meat $\cdot$ capita^{-1} $\cdot$ year^{-1} (DGE 2000/01) instead of actually i.e. in Germany (2002):60 kg$\cdot$ capita^{-1} $\cdot$ year^{-1}]
[Actual animal stockings and densities according to EUROSTAT 2005]

Countries	Actual Animal densities ($AU \cdot capita^{-1}$)	Necessary Reduction Livestock (%)	Countries	Actual Animal densities ($AU \cdot capita^{-1}$)	Necessary Reduction Livestock (%)	Federal Lands of Germany	Actual Animal densities ($AU \cdot capita^{-1}$)	Necessary Reduction Livestock (%)
1.Ireland	1.606	-94	14. Hungary	0.263	-62	1. Schleswig-Holstein	0.466	-79
2.Denmark	0.846	-88	15. Bulgaria	0.254	-61	2. Niedersachsen	0.456	-78
3.France	0.390	-74	16. Estonia	0.241	-59	+Hamburg		
4.Belgium	0.382	-74	17. United kingdom	0.240	-58	+Bremen		
5.Netherlands	0.380	-74	18. Greece	0.238	-58	3. Mecklenburg-Vorp.	0.404	-75
6.Cyprus	0.359	-72	19. Finland	0.227	-56	4. Bayern	0.311	-68
7.Luxemburg	0.355	-72				5. Sachsen-Anhalt	0.252	-60
8.Spain	0.341	-71				6. Thüringen	0.232	-57
9.Lithuania	0.339	-71	**20. Germany**	**0.226**	**-56**	**Deutschland**	**0.226**	**-56**
10. Austria	0.308	-67	21. Portugal	0.226	-56	7. Sachsen	0.156	-36
11.Romania	0.304	-67	22. Czech.Republic	0.224	-55	8. Nordrhein-Westf.	0.154	-35
			23. Sweden	0.205	-51	9. Baden-Württemb.	0.140	-29
EU-15	**0.294**	**-66**	24. Latvia	0.197	-49	10. Brandenburg	0.130	-23
12.Slovenia	0.293	-66	25. Slovakia	0.177	-44	+Berlin		
13. Poland	0.292	-66	26. Italy	0.174	-43	11. Hessen	0.106	-6
EU-25+2	**0.290**	**-64**	27. Malta	0.123	-19	12. Rheinland-Pfalz +	0.094	+7
EU-10+2	**0.275**	**-64**				Saarland		

Re0785

Fig.1: Tax Levy Model for Animal Products to Relieve the Environment and Public Health

(Re0715)