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**SATELLITE ACCOUNTS FOR AGRICULTURE AND ENVIRONMENT :
INTEGRATING THE TOTAL ECONOMIC VALUE
CONCEPTS AND FIRST EXPERIENCES IN SWITZERLAND**

Invited paper submitted by the Swiss Federal Statistical Office*

Summary: The present paper aims to give a condensed overview of the state of the art in Switzerland of agro-environmental accounts, integrating multifunctionality, and implementing an “total” accounting approach based on the integration of the total economic value.

A historical introduction gives a brief description of the evolution of the Swiss agriculture during the last 150 years, leading to its actual mandate. A definition of multifunctionality will be attempted, taken over into a theoretical construction of the total economic value, and translated into an accounting architecture: the agro-environmental accounts, satellites of the National Accounts core. Some instrumentation ideas are then revealed, following a gradation between tangibility and intangibility, from market to off-market inputs and outputs.

With the practical enlightening “Survey and quantitative appreciation of the externalities in Swiss agriculture”, the existing and feasible is displayed, leading to a conclusion which puts into perspective the chances (strengths) and risks (limits) of a “total and complete” description of a multifunctional agriculture.

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Towards a multifunctional agriculture in Switzerland

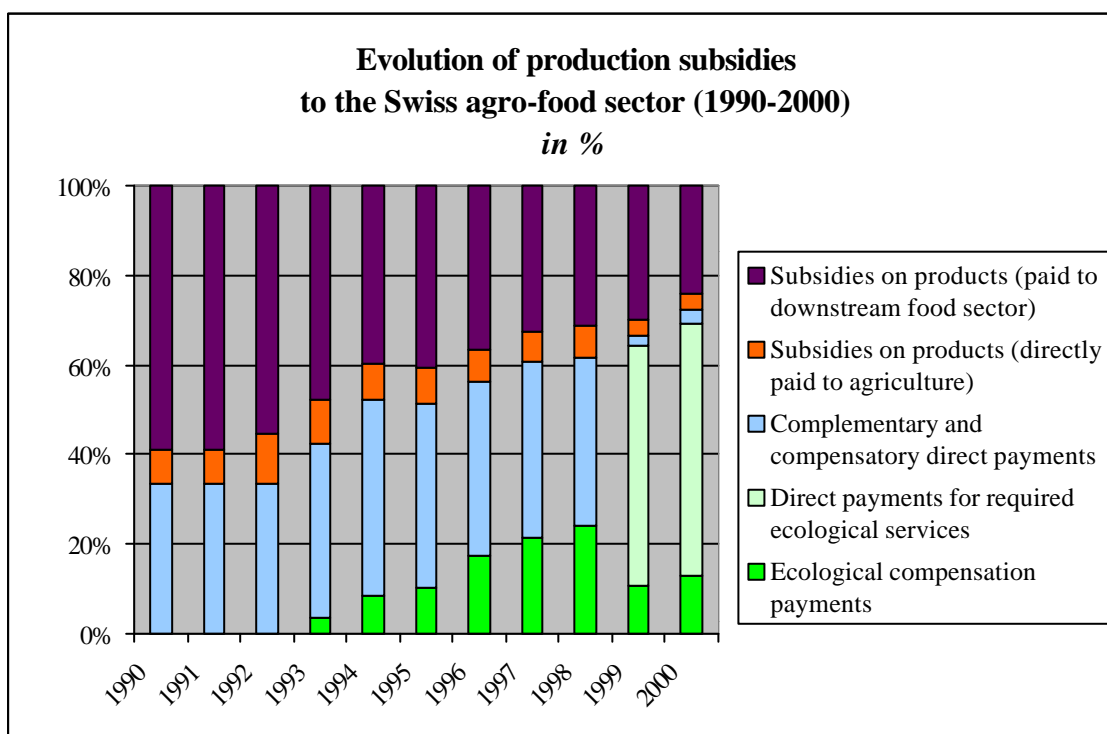
1. The Swiss agriculture has experienced many changes during the last 150 years. The second part of 19th century has been characterised by a very strong restructuring of the agricultural fabric, rural-
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urban migration towards the developing industrial poles as well as emigration overseas. At that period, the Swiss rural areas were poor, the competition of agricultural imports fierce (Ukraine, USA, Canada...) and the need of labour force by the industry unknown before.

2. World War I and the following economic crisis put forward the evidence of deficiencies in food security and supply. The awareness of the necessity of an agricultural and food security policy grew and became reality during World War II. Although Switzerland remained saved from direct conflict, it had to insure a high degree of self-sufficiency through agricultural production. This “productivism” shaped the Swiss agricultural policy for decades, until the seventies, strengthened by a never-ending economic growth.

3. The following crises, especially in the watch industry, brought up the necessity of regional and rural policies, and the stability of the agricultural structures based on farming households, catalyst of rural development, became a political priority.

4. In the eighties, the material standard of living of the population was one of the highest in the world, and the nightmare of supply deficiencies has blurred since long ago, leaving room for qualitative issues and fundamental changes in consumption patterns.



5. After a period of inflationary overheating, the public finances degraded during the nineties. Simultaneously, the international requirements for liberalisation of the agricultural markets became effective (World Trade Organisation). The agricultural policy had to be reviewed, and reformed in successive stages. Increasing importance was laid in direct payments. The end of the cold war stressed the general consciousness that the concept of food security had to be revised. In getting out, step by step, from market intervention, the State began to promote a multifunctional agriculture with direct payments (see above graphic), respectful of the environment, and producer of quality goods. The late

crises in the meat branch (BSE bovine spongiform encephalopathy, Foot and Mouth Disease) have underlined the requirements for a sustainable development, and the importance of a mutual trust between a multifunctional agriculture, manager of natural resources, and the tax-paying and consuming citizens.

What is multifunctionality of agriculture? An essay of synthetic definition

6. Before conceiving a construction of agro-environmental accounts, supposed to describe the performance of a multifunctional agriculture, a definition of that multifunctionality has to be attempted.

7. The functions of agriculture can be summarised as follow. We refer to the objectives of the Swiss agricultural policy and to the latest study on that question mandated by the Swiss Federal Office of Agriculture¹ (a suite to numerous research studies performed at national and international levels, as the work on amenities by the OECD).

8. A priori, externalities can be positive or negative, sometimes contrivers, but by any mean, both sides have to be taken into account [+/-]

Functions	Type	Description	
The commercial function	Market inputs and outputs	It's the strict agricultural economy, producing agricultural goods and services. This market activity is covered by the Economic Accounts for Agriculture (EAA97) resp. the Agriculture Branch Accounts.	
The regional function	External effects, societal externalities	Decentralised occupation of the territory (minimal or optimal population density), regional economy, employment, equilibrium between rural and urban areas, vitality of villages [+/-].	Maintaining and structuring landscape ([+/-] contribution for tourism...)
The social function		Customs, traditions, conservation of traditional working methods, know-how in environmental management, education (values), training [+/-].	Natural risks: protection (or endangering) [+/-] of infrastructures (erosion, landslides, avalanches).
		Security and national defence (self-sufficiency potential) Change in location and reference of the food footprint (contribution to the world food supply) [+/-].	Welfare (human beings, animals), health, emissions [+/-].
The ecological function: ecosystems and biodiversity	External effects	Conservation / degradation of soils, water resources (lakes, rivers, ground water) and other natural resources [+/-].	
	Enternalities	Biotope, biocenose, genetic diversity [+/-].	
		Agriculture as transformer, condenser and incorporation mean of solar energy (eEnergy, "embodied energy") in the human food chain (sun, precipitation, soils) [+/-].	
		Dualistic development of energy density: concentration poles, peripheral fallow.	

Towards the total economic value of agriculture (TEV)

9. The accounting implementation of multifunctionality can presumably be done in different ways. The present proposed theoretical approach is that of *the evaluation of the total economic value (TEV)*².

10. Basing on performed work underlying the *Multifunctional Forest Account*³, the latest developments in the field of valuing agricultural multifunctionality have been added¹.

11. Without wanting to make here a large and comprehensive description of the different alternatives and evaluation theories, we shall limit us on the “WHAT”. The “HOW” could be the object of a detailed methodological conception, but acceptance of the TEV principles is a prerequisite. We shall apply a TEV classification which could also be applied to forestry, in order to define an accounting framework, and to reveal at what moment the evaluation of environmental goods and services will imply *to put a price on what hasn't a price*.

Construction of the total economic value (TEV):

Total economic value	=	Use value (direct, indirect)
	+(-)	Option value (optional future use)
	+	Existence value / intrinsic (non-use)

12. The TEV, where the different elements are defined, is now put into relation with the functions of agriculture. The TEV proposes to go further than the “Total agricultural value “ (TAV), in that sense that *the different functional types are not only unified, but valued and aggregated*.

Total economic value	Definition	Functions			
		Commercial	Social, security	Regional	Ecological, ecosystems, biodiversity
Direct use	The outputs are directly consumable. It's typically the market production of the agricultural branch, evaluated by an Economic Account for Agriculture (EEA97) for example.	Results of EAA97	Effectively realised and paid <i>willingness to pay</i>	Investments and current operating expenditures (regional development)	-
Indirect use	The functional advantages, the saved/avoided costs. It's the insurance premium (real estate, food, unemployment...) which hasn't to be paid... but also the compensation for damages caused by agricultural activity.	-	Potential willingness to pay	Potential insurance premiums	Technological replacement costs and restoration
Option value	Future use is optional, although the option value is not a value in itself: more, it's the value placed on the option (direct/indirect use, present or future?).	Future market potentials (discounted)	Future willingness to pay (discounted), actualised risks (pollution), future insurance premiums (discounted).	Potential insurance premiums, consumer part (over cost)	Future market potentials (discounted)
Inheritance value (sustainable development)	It's the devised/bequeathed value. One leaves to future generations an environmental state, leaving them full power to take any management options in future. Heritage is also a form of "saving", it's the balancing item of the actual use.	Productive assets (fixed assets, stocks, labels, quotas, liabilities...)	Bequeath of investments, potentials and risks.		Bequeathed natural heritage; Bequeathed damages to the natural heritage.
Existence value	It's the value placed on the non-use, resulting from a present (or past) choice implying renunciation of all present and future uses. In principle, one doesn't take (or leaves) any options on a future use. Besides it's delimiting role, human society forgoes any inference: is it the value of the withdrawal (exit) of agriculture, bringing a new classification into natural heritage and in parallel an economic disappearance?	Renunciation of present and future commercial production.	Renunciation of present and future social, protection and security functions.	Renunciation of present and future regional function	Renunciation of (today unknown) "market" potentials (biodiversity) but "exploitation" of external effects.

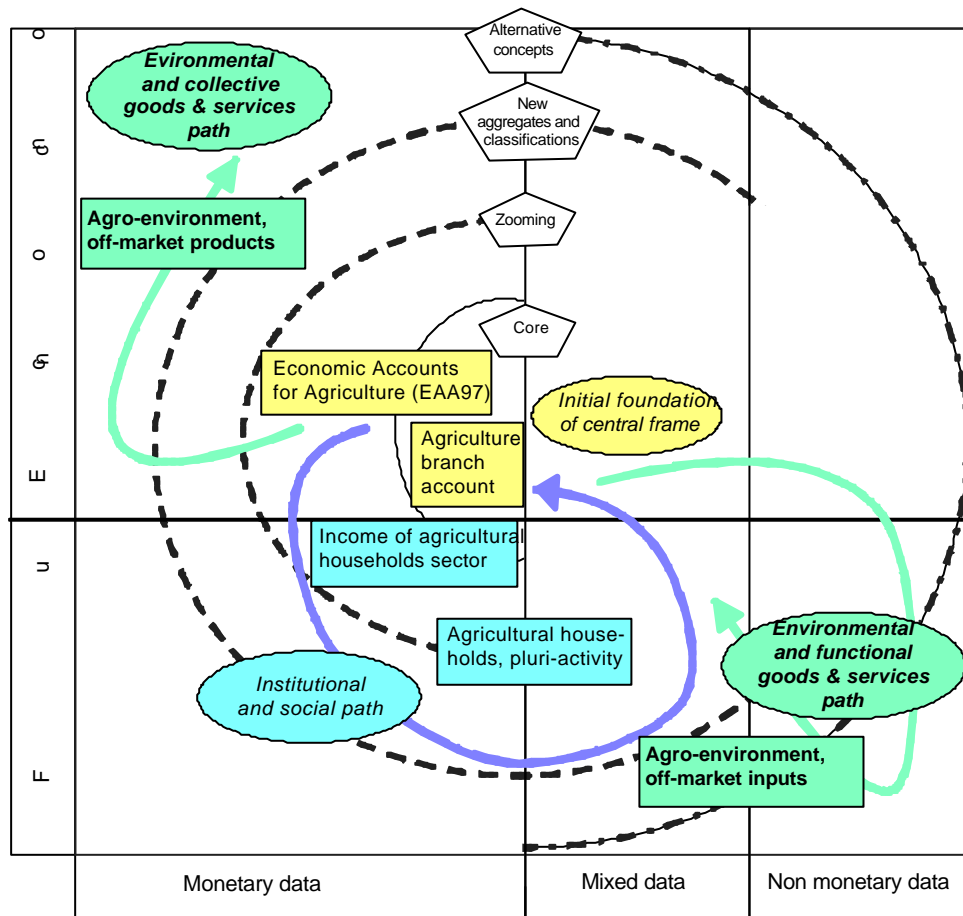
Position of agro-environmental accounts

13. In 1998, the Swiss Federal Statistical Office started with the realisation of a longwinded project (planned until 2008), the System of economic and satellite accounts for the primary sector (SAKO-1). The conceptual work was initialised with prospecting the needs and available literature, methodologies and approaches. As expected, the results of this market study were very heterogeneous, and had to be structured to crystallise common points, links and priorities. For that, a graphical typological approach was attempted, in order to illustrate the palette of modules which will theoretically constitute the System

to be built. Briefly, the typology of satellite accounts is organised around three axis, the core being the System of National Accounts (according to SCN93-UN resp. ESA95-Eurostat methodology).

Degrees (freedom of accounting)	Options	Zones
<ul style="list-style-type: none"> • Zooming 	<ul style="list-style-type: none"> • Economic activities and products 	<ul style="list-style-type: none"> • Monetary data
<ul style="list-style-type: none"> • New aggregates and classifications 	<ul style="list-style-type: none"> • Functions 	<ul style="list-style-type: none"> • Mixed data
<ul style="list-style-type: none"> • Alternative concepts 		<ul style="list-style-type: none"> • Non monetary data

14. The agro-environmental accounts are positioned in the typological framework, where we also show the central frame and specific accounts, and the agricultural households' accounts as well:



15. The dark side of the truncated core (around which gravitate specific and satellite accounts) symbolises the « residual »⁴, in other words the virtual place of complementary dimensions end alternative concepts in the construction of a core more complete than it is actually.

Architecture of agro-environmental accounts based on TEV

16. The choice of integrating those agro-environmental accounts in a satellite system implies that the evolution path towards the total economic value starts at the core (Agriculture Branch Account, Economic Accounts for Agriculture). The valorisation of the different uses (in monetary terms) is done on an account grid which finds its origins in the ESA95 framework. Then, the different layers or “alternative” degrees are crossed, by adapting successively the classifications.

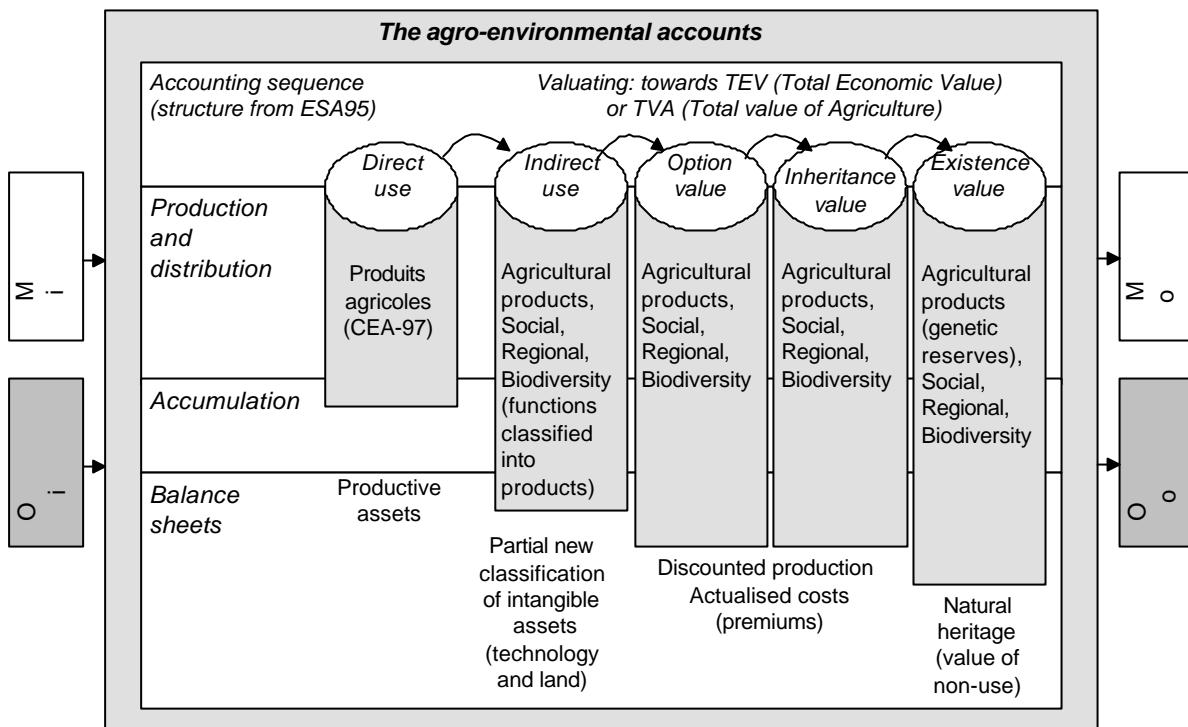
- Functions becoming activities and products,
- Externalities production technologies, valued as “intangible non-produced assets” (labels);
- New classification into “tangible produced assets” (land), with the transfer of the balance sheet (economic in the sense of ESA95) towards a natural heritage balance sheet. This implies the recording of transaction costs, of economic disappearance of assets, enabling an “natural” appearance of those same assets, this mutation being a consequence of their renunciation (changing into non-use).⁵

17. The off-market inputs (solar energy, air, water, soil), recorded in successive modules, can be added:

- As non-monetary dimensions (energy⁶, water, air, soil), for which the integration with monetary dimensions (uses) belongs to the field of interpretation or cross-projections, as no direct accounting link can be revealed;
- As intermediary consumption goods (valued) or production factors (valued). This dimension can then be integrated into the accounting architecture. No need to say that this valuation is very problematic: what are their replacement values?

18. And that is how, through this modular approach, all the degrees from tangibility to intangibility of the total economic valuation can be combined, in a transparent and systematic way.

Synopsis of the agro-environmental accounts



Accounting pathway

19. The table below shows synthetically the pathway leading us from direct use to the total economic value, building up, step by step, the accounting architecture of the agro-environmental accounts:

Accounting sequence	Total economic value : from tangibility (direct use) to intangibility (existence value))				
	Central framework (ESA95, EAA97)	Satellite framework, successive passages until alternative mode (adding new concepts)			
	Direct use	Indirect use	Option value	Inheritance value	Existence value
Production Generation of income Entrepreneurial income	Actual market production, according to EAA97				
		⇒ Functions become products, the activities and products classification is completed			
			⇒ Potential production is discounted, risks are actualised.		
				⇒ Production of an interme-diary service (heritage)	
					⇒ Production of non-use
Capital (accumulation)	Machines, equipment, real estates				
		⇒ The environmental technology has to be written off			
			⇒ Potential accumulation		
				⇒ Heritage of option values placed on the substitution of natural heritage / productive assets	
Revaluation and other changes in assets		⇒ Economic appearance (labels, "externality" land)			
			⇒ Revaluation, potential economic disappearance		
	<i>No revaluation accounts and other changes in assets in the EAA97</i>			⇒ Revaluation, natural appearances and disappearances, bequeath of options appearance / disappearance (substitution natural/economic)	
					⇒ New classification from economic into natural assets and attribution of a value of non-use
					⇒ ???
Balance sheets	Agricultural land				
		⇒ Environmental technology, "externality land"			
			⇒ Potential assets (net worth)		

			⇒ Natural heritage (bequeath value)	
				⇒ Total assets (existence value)

Instrumentation ideas for the off-market outputs

20. By taking again the above table, a first conceptual instrumentation approach is done. What are the available tools and sources?

Tangibility degree	Accounts	Value types	Thinkable sources
Direct use	Production, generation of income, entrepreneurial income, capital (elements)	Economic valuation according to the central framework (EAA97)	EAA97, Agriculture Branch Account
Indirect use	Production, generation of income, entrepreneurial income, With sub-accounts according to the functions of agriculture (translated into services)	New repartition of EAA97 items according to functions (services) of agriculture: <ul style="list-style-type: none"> • Intermediate consumption • Compensation of employees (salaries) • Debt interests, rents... 	Analytical accounting of pilot holdings (rational production of environmental services)
		New attribution of EAA97 public transfers according to functions (services), especially translation of subsidies for environmental or protection services into collective buy of environmental services.	EAA97 and functional repartition key, implemented in a public transfers account
		Recording (as resources) of insurance premiums (avoided risks thanks to protection service). Recording (as uses) of insurance premiums for caused risks and damages.	Geomatic simulation model, where the value of protected assets and human activity can be evaluated: <ul style="list-style-type: none"> • Infrastructures • Local economic activities • Flows (traffic) • Demography, density
	Recording of willingness to pay for the social function (free time, education). Recording of the compensations required by the collectivity for negative emissions caused by agriculture.	Same approach for the social function with the proximity analysis of urban centres (consumption poles).	
	Accumulation and balance sheets, consumption of fixed capital ("writing off")	Recording of economic appearance of "know-how" assets and "positive externality land", taking the role of production factor for the social, regional and ecological services. Valuation of consumption of fixed capital "assets transaction costs" for "know-how" and "land".	Valuation of training? Consented investments for maintenance, conservation and renovation (Permanent Inventory Method)? Unique writing off of the transaction costs?
Option value	All sub-accounts	Valuation of future production according to a discount rate (rate should be rather low). Actualisation of risks (negative external effects). As counterpart, the production costs and the consumption of fixed capital have to remain coherent. The option will take into	Behaviour scenarios facing the options (substitution between production and potential conservation). Rather low discount rate (choice may be contrived).

		<p>account:</p> <ul style="list-style-type: none"> • The direct uses (commercial, discounted projections based on EAA97), • The indirect use, meaning projections of the option value of premiums in the future. 	Cost/Benefit analysis and projection of risks and damages in function of the evolution of actual and future production.
Inheritance value	All sub-accounts	Bequeath value ("options portfolio", actualised assets diminished by the liabilities, inventory of outstanding court cases and renovations), representing in some way "the heritage of our values and damages" for the future generations (the permanence of our actual behaviour cannot be guaranteed).	Administrative costs linked to the outstanding court cases, value and actuary compensation of natural heritage, necessary future investments for renovation.
Existence value	All sub-accounts	Internalisation of the costs for renovation and monitoring of non-use (from renunciation to agricultural production). Calculated value of the natural heritage.	<ul style="list-style-type: none"> • State accounts • Value in emergency ?

Instrumentation ideas for the off-market inputs

Tangibility degree	Accounts	Value types	Thinkable sources
Direct use	According to EAA97	Non-monetary / off-market inputs are not valued by the EAA97. The direct use (intermediate consumption as uses of the production account) represents direct market inputs.	EAA97
Indirect use	Production	<p>Three approaches are theoretically possible, the issue being the “completion” of the market intermediate consumption:</p> <ul style="list-style-type: none"> • The non-monetary inputs are left in their state, expressed in their non-monetary dimensions. The analyst will then proceed with multi-criteria projections and interpretations. • Transformation of market inputs into physical units, homogeneous with off-market inputs (eMergy, water...). • Transformation of off-market inputs into monetary units, although the valuation by “direct replacement” may lead to debatable results. 	<ul style="list-style-type: none"> • Elementary cycle (solar energy, water, air, soil) are specialised to take into account the agricultural or post-agricultural ecosystem. • The academic research works (universities, institutes of technology, agronomic research stations) could provide data. • Conversion tables for market inputs (eMergy).
	Generation of income	Not concerned?	Not concerned?
	Entrepreneurial income	<p>Two thinkable approaches for an alternative land rent:</p> <ul style="list-style-type: none"> • Definition of a rent for the soil factor (in cumulating of an eventual propriety rent, recorded in the central framework), attributing a “ownership” function to environment; • No add, the “ownership” function to environment isn’t relevant, as the soil factor could be considered as an asset to maintain, the main issue being to attribute a consumption of fixed capital. 	No solution?
	Capital Revaluation Other changes in assets	<p>Two thinkable approaches for accumulation or disappearance of the factor soil:</p> <ul style="list-style-type: none"> • Don’t value anything ; • Definition of a soil depreciation that takes into account the loss of fertility, structure and depth (erosion). The asset “soil” is certainly one of the off-market inputs which is able to “react” to the agricultural production behaviour. 	<p>Actualising the replacement value of soil, based on a respectful and sustainable management and renovation (periodic care) of a soil (the genesis process taking place other many decades).</p> <p>A simulation mode has to be found or created, with the intensity of agricultural production and the intensity of conservation.</p>
	Balance sheets	The assets are the stock which has been constituted by accumulation operations (capital account, revaluation, other changes in assets).	-

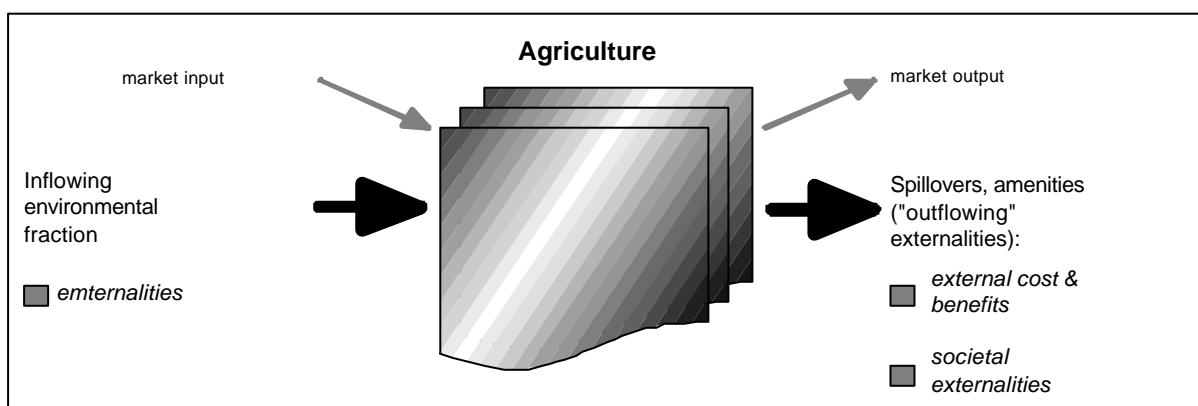
Option value	From production to balance sheets	The actual economic activity (in direct and indirect use) is converted into option value. By coherent analogy, introduction or not of off-market inputs in an option value perspective.	The above mentioned simulation model, in an option value modus.
Inheritance value	From production to balance sheets	Same than above, but conversion in inheritance values.	The above mentioned simulation model, in an inheritance value modus.
Existence value	From production to balance sheets	<ul style="list-style-type: none"> The implications of non-use on consumption (immobilisation, transformation) of off-market inputs are to be quantified... or valued. 	The above mentioned simulation model, in an extreme extensive modus, being at the limit the non-use.

Survey and quantitative appreciation of the externalities in Swiss agriculture chosen extracts

Purpose of the study

21. The study "Survey and quantitative appreciation of the externalities in Swiss agriculture"¹, carried out by Écosys® SA (Geneva-Carouge, Switzerland) in 1999-2000, has been mandated by the Federal Office of Agriculture (FOA). The purpose consisted in appreciating quantitatively the externalities in Swiss agriculture. The challenge was to evaluate, beyond its economic function, the ecological and social functions of agriculture. A full review of the literature was made with respect to all existing externalities. These have then been classified and categorised, and their amount quantitatively evaluated by using different methods.

Form the survey to quantification of externalities



Methods and values

■ Emternalities (sic)	Valuation by using the eMergy synthesis; values were produced with respect to actual energy data (embodied solar energy).
■ External cost & benefits	External benefits were assessed with economic, preference-related valuation methods; corresponding values were gathered from the literature and transferred; external costs were assessed by using Swiss estimates and adapted.

■ Societal externalities	Evaluated by using OECD indicators, with values set by using Swiss estimates.
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Quantification

■ Emternalities	The eMergy synthesis of Swiss agriculture was realised following an internationally established protocol.
■ External cost & benefits	External benefits: (individual, preference-related) external benefits were estimated by transferring values found in the literature (weighting process taking into account Swiss specificity). Costs for Swiss agriculture (pollution costs such as environmental damages and corrective costs necessary to reach or maintain an environmental standard) were directly and locally calculated.
■ Societal externalities	Indicators mentioned in the literature were applied to Swiss agriculture by using most recent local data and statistics.



Results

■ Emternalities	Place that the Swiss agro-system holds vis-à-vis the natural environment.
■ External cost & benefits	A “balance sheet” superposing costs and benefits informs on the evolution of their gap.
■ Societal externalities	Appreciation of course vis-à-vis societal norms and values set trends.

Results and interpretation

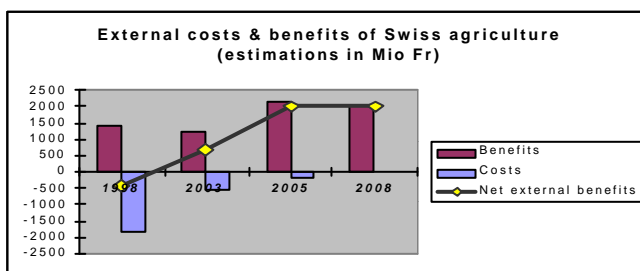
■ Emternalities

Emternalities shed light to the free contribution of nature that is not remunerated by agriculture. They participate to 19.6% in the agriculture input share structure (other inputs being contributed through the market place).

<i>Emternalities (free environmental contribution)</i>	<i>EmJ / year (solar joules)</i>
Emternalities, of which	2.44 E+21
renewable (sun and rain) :	2.28 E+21
Non renewable (soil) :	0.16 E+21

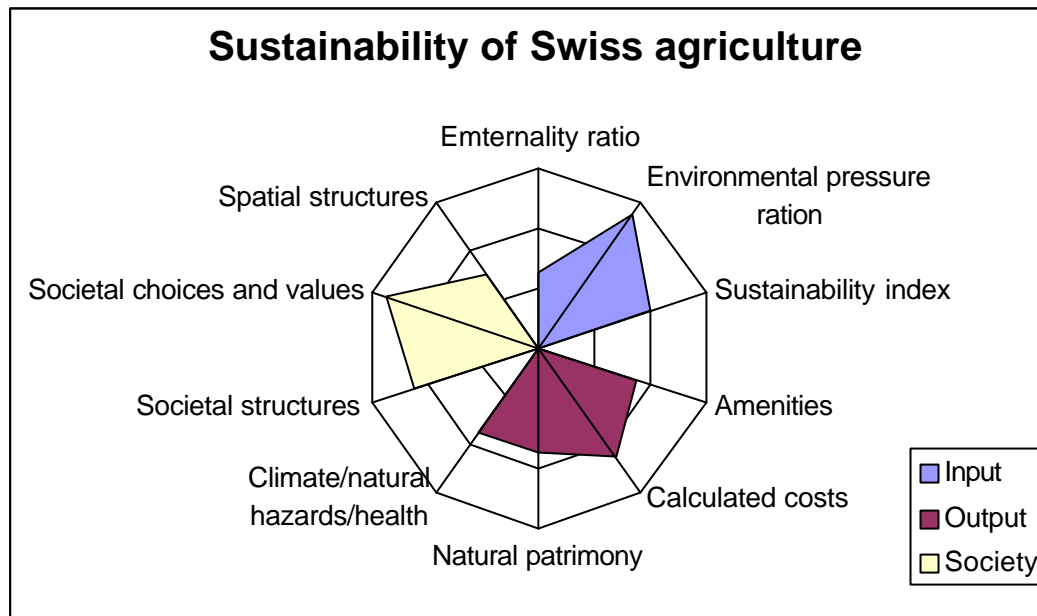
■ External cost & benefits

Benefits related to amenities (landscape, etc.) are constant. Pollution costs level as environmental programmes are implemented, and become insignificant only after 2008 (inheritance), as for corrective costs. Externalities belonging to the “natural patrimony” and “climate, natural hazards, health” categories are slowly replaced by benefits. Globally, one estimates that benefits will appear 5 years from now, once ecological standards and goals are achieved.



indicators for each societal externality. The trend was not quantified but generalised (global trend).

<i>Items</i>	<i>Distance from the norm</i>
Societal structures	remaining unchanged - approaching
Spatial structures	departing – remaining unchanged
Social values and choices	approaching- satisfying



Legend:

Input: ecological contribution (environmental fraction – eMergy synthesis) to sustainability.

Output: environmental contribution (external costs and benefits) to sustainability.

Society: societal contribution to sustainability.

The graph perimeter symbolises a maximum contribution to sustainability whereas the very centre of the rosette indicates a minimum contribution to sustainability. Shaded areas have no mathematical significance.

22. A global and composite result can be obtained. This overall result is not a simple aggregation of the externalities (where everything would have been expressed in Swiss Francs). It is the result of an agricultural system, in which not only the economic efficiency is considered, but also the socio-cultural acceptance and the respect of the environment. It is the result of a “re-evaluation” of the importance of agriculture as a multifunctional economic sector, with economic, social and ecological value added.

From theory to realisation: feasibility elements

23. The differences between the theoretical part and the practical enlightening shown in the present paper illustrate the big difficulties and controversies linked with the realisation step.

- Aggregation or composite union?

TVA or TEV?	
Theoretical construction of agro-environmental accounts	Architecture is based on an account sequence, where a monetary and balanced valuation is wanted, based on the theory of “Total Economic Value” (monetary aggregation and account balancing).

Essay of quantification	The survey and quantitative appreciation of Swiss agriculture, together with its economic function, can be unified but not aggregated, in a composite perspective, constituting the “Total Value of Agriculture”.
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- Strengths and limits?

	Strengths and opportunities	Limits and risks
Theoretical construction of agro-environmental accounts	<ul style="list-style-type: none"> - The existence of economical environmental theories opens the door for consideration (at least theoretically) of the total economic value approach... - Studies have been carried out in this domain... - A new core could emerge (contribution of agriculture to the total economic value of the primary sector and... the TEV of the total national economy). - Those agro-environmental accounts could help to better understand the evolution towards a multifunctional agriculture. 	<ul style="list-style-type: none"> - False interpretations - Disposability of data sources. - Controversies and conflicts between economic theories and schools. - The functions of agriculture, which have to be transferred into production (indirect use, etc.), are numerous, of divergent nature and with more or less relevant levels in the field of valuation. - The dynamics, in the sense of substitutions between market production (very diverse in agriculture) and off-market services are very complex. - The valuation of off-market inputs and outputs are based on hypothetical approaches (big differences between “willingness to pay” and effective payments).
Essay of quantification	<ul style="list-style-type: none"> - Appreciation of externalities does not resume to external effects in a strict sense. - Several methods are applied. - Composite and non-unilateral evaluation and global interpretation of results (what agriculture owes to society and what society owes to agriculture). - Agriculture becomes a complete sector for which one could precise the total value, basing on the externalities (as complement to the market evaluation). - Big scientific progress has yet to be done, so the composite 	<ul style="list-style-type: none"> - The global character of appreciation doesn't enable to designate particular services for which an exact counterpart is looked for. - The global appreciation doesn't sufficiently render the economic, geographic and cultural diversity of Switzerland. - More comparisons between the Swiss agro-ecosystem and those of other countries and periods would have offered a better description of the typicality of Swiss agriculture.

	<p>approach “EAA97 & indicators for multi-functionality and sustainability” seems to be a pragmatic path.</p>	<ul style="list-style-type: none"> - The absence of sensibility analysis (modification of reference points). - The composite result and the “impossibility”(?) of reunification (internalisation, monetary evaluation).
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Conclusion and perspectives: understanding the evolution towards multifunctionality

24. The market hasn't taken everything into account... implying that the statistical instruments conceived for the observation of agricultural markets cannot inform about the entirety of the issues of a multifunctional agriculture...

“Any economic activity of production and/or consumption can extend its effects beyond the circle of market and prices: those are the external effects. Some are negative, like the degradation of environment. Other can be positive, as a conserved landscape. Those effects are *off-market*, in the sense that neither their production nor their consumption (even more the fact of undergoing them) has been the object of a transaction... One may agree that if the market is efficient for itself, it is not in face of environment and, more generally, in face of the externalities that it generates. Left on its own, *the market tends to produce too many negative externalities and not enough positive externalities.*”¹

So appears the state intervention, trying to equilibrate the limits of the market with the demand on collective goods and services...

“As matter of fact, on one side the market is supplanting protectionism and, on the other hand, the agricultural sector tends to find (again) its importance, not in usual economic terms (part of GDP), but as being related, beyond the market boundaries, to domains such as environment and society”.¹

25. Statistical information about multifunctionality is needed... but to what extent should externalities be monetary evaluated (positive and negative), and what is the guarantee of international comparison at mid-term?

26. Have we got to reunify “composite multi-criterias” (total value of agriculture) in order to reach the monetary aggregation of the total economic value of agriculture?

Finally, what do we really need?

27. An instrument panel, enabling the monitoring of the economic, ecological and social performance of agriculture? Or more, like an accounting tool giving a balanced quantification of the TEV of agriculture, helping to grasp and even to orient the offer and demand in collective goods and services, and to master the use of off-market inputs?...

28. The monetary valuation of environmental aspects is very contrivers. Should “only” be concentrated on the measure of trend evolutions?

29. However, the TEV approach is the concept of the final sequence of satellite accounting modules like “agro-environment” or “multifunctional forests”. Their object is not to “reproduce” environmental

indicators established elsewhere. They aim to extend the perspective towards an accounting approach, balanced, in equilibrium and total.

Yet, in the actual state of the art, a pragmatic approach may seem more prudent...

30. The study “Survey and quantitative appreciation of the externalities of the Swiss agriculture” and an OECD seminary held in 1999 in Washington D.C. have shown that the monetary evaluation of off-market inputs and outputs proves very difficult, being in majority based on hypothetical “Willingness to pay” approaches (big differences between estimated announcement and effective payments). The different aspects shouldn’t be cumulated, because it may certainly lead to an overestimation of the values (difficulty of interpersonal utility comparisons for example):

- Work with a composite approach, combining for example the Economic Accounts for Agriculture (EAA97) with indicators about multifunctionality and sustainability.
- Promote scientific research in that field, where big progress has yet to be done.

Abbreviations and bibliographic notes

Abbreviations

BSE	Bovine Spongiform Encephalopathy
EAA 97	Economic Accounts for Agriculture, Eurostat Manual Rév.1.1
ECE	Economic Commission for Europe
EmJ	eMjoule (Embodied Solar Joule)
EUROSTAT	Statistical Office of the European Communities
FAO	Food and Agriculture Organisation of the United Nations
OECD	Organisation for Economic Co-operation and Development
FOA	Federal Office of Agriculture (Switzerland)
SFSO	Swiss Federal Statistical Office
GDP	Gross Domestic Product
SAKO-1	System of economic and satellite accounts for the primary sector from the SFSO (project)
SNA 93	System of National Accounts (United Nations, 1993)
ESA 95	European System of Accounts (Eurostat, 1995)
TEV	Total Economic Value
TVA	Total Value of Agriculture

Bibliographic notes

The bibliographic notes are very reduced here. Nevertheless, the literature about the here presented topic is abundant, and the works of SFSO, FOA and Écosys SA mentioned above contain comprehensive bibliographies, available on demand:

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NOTES

¹ Survey and quantitative appreciation of the externalities in the Swiss agriculture, Federal Office of Agriculture, mandate by Écosys SA, Bern and Geneva, January 2000

² Project SAKO-1 (System of economic and satellite accounts for the primary sector), Global concept for a satellite framework (with support from Écosys SA, Geneva-Carouge), Neuchâtel (2000).

³ Development and cost/benefits application in forest transport networks and other domains (sylviculture, natural hazards), Ecosys SA, report for the Swiss Forest Agency (Federal Office of Environment, Forests and Landscape), November 1997, 70 pp. + Annexes

⁴ US National Research Council, Nature's Numbers – Expanding the National Economic Accounts to Include the Environment. National Academy Press, Washington, D.C. (1999)

⁵ At the limit (in analogy to the treatment of forests and standing timber), a new classification of fallow into fixed assets would imply that current assets (potential fodder) would be valued. First, this "fodder" isn't often harvested or pastured. Secondly, the valuation of true roughage is already controversial in the EAA97. Thirdly, it may seem exaggerated to accord a character of environmental production factor to the only vegetable cover of the fallow. Fallow, leaven to its own dynamic, would evolve much more substantially than an already wooded cover, and any ecosystem evolution should be recorded in the "Natural assets revaluation account". At that stage of thoughts, we prefer to make a revaluation of the land itself. We are aware of the remaining contradiction with the treatment done in the multifunctional forest account. A complementary approach would be to consider the evaluation of fossil subsoil assets (oil).

⁶ eMergy, « embodied energy », corresponding to the embodied solar energy in the cycles and biomass, by photosynthesis, evaporation, etc.