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(Machine translation)

THE DEVELOPMENT OF THE CAPITAL ACCOUNT OF THE AGRICULTURE BRANCH IN FRANCE

1. Gross fixed capital formation

2. Consumption of fixed capital and the other entries of the account

1. Gross fixed capital formation

1.1 The contents of this heading

1.1.1 General definition

According to the ESA 95, “*Gross fixed capital formation consists of resident producers' acquisitions, less disposals, of fixed asset during a given period plus certain additions to the value of non produced assets realised by the productive activity of producer or institutional units. Fixed assets are tangible or intangible assets produced as outputs from processes of production that are themselves used repeatedly, or continuously, in processes of production for more than one year.*

Fixed asset transfers exclude:

- a) consumption of fixed capital (which includes the current accidental damage which is envisaged);*
- b) exceptional losses resulting, for example, from situations of drought or of other natural disasters (recorded as an other change in the volume of assets).*

Various types of gross fixed capital formation can be distinguished:

- a) acquisitions, less disposals, of tangible fixed asset;*
- b) acquisitions, less disposals, of intangible fixed asset;*
- c) major improvements to tangible non- produced assets, in particular those pertaining to land (though the acquisition of non produced-assets is not included);*
- d) costs associated with the transfer of ownership of non-produced assets, like land and patented assets (though the acquisition of these assets is not included).*

Gross fixed capital formation excludes transactions included in intermediate consumption like purchases of small tools used for production purposes, ordinary maintenance and repair work... ” (§ 3 102-108).

In addition, gross fixed capital formation has to be valued at purchaser prices excl. deductible VAT.

1.1.2 GFCF of the agriculture branch

Gross fixed capital formation of the "agricultural" branch includes two large components: on the one hand, gross fixed capital formation in agricultural products and, on the other hand, gross fixed capital formation in non agricultural products.

a) GFCF in agricultural products corresponds to production for final use of the branch. GFCF of the "agricultural" branch in agricultural products is made up exclusively of two types of products: animals and plantations.

The GFCF in animals

It corresponds to animals used as production factors for several years; this involves reproduction of livestock (including milk) and draft animals. Animals for slaughter are recorded under changes in stocks.

GFCF in animals is equal to the difference between the values of the entries and disposals of the asset . It is therefore calculated by the algebraic sum of four terms:

the entries in capital by birth and natural growth until the adulthood

- the disposals for slaughter

+ the balance of external trade of live animals (imports - exports)

+ the balance of internal trade of live animals, which corresponds to expenses connected with the acquisition of reproductive and feature animals, included in the value of the purchases, but not in the sales of the branch.

GFCF in animals is evaluated for large cattle, pigs, sheep, goats and equines. On the other hand, it excludes calves (by definition) as well as poultry and other animals such as rabbits, since in general they live less than one year.

GFCF in plantations

It corresponds to plants with permanent production, i.e. fruit tree and vine plantations, for fruit and wine production, and represents the value of the growth of the trees until they have reached maturity (in terms of a possible transfers). In concrete terms, it corresponds to: expenditure on new plantations (or of renewal¹) plus the increase in the intrinsic value of the plantation up to their maturity and the value of the costs of the transfer of ownership.

This definition shows that the value of GFCF in plantations does not have to be decreased by the value of grubbing-up, whether those are current grubbing-up or exceptional grubbing-up, which are analysed either as withdrawals of asset (anticipated by the CFC), or like "other changes in the volume of assets". There can however be transfers, which constitute a negative GFCF. On the one hand, plantations can be subject of trade between farmers, but transfers are then counterbalanced by acquisitions and do not have any impact on the end value of the

¹ Expenditure corresponds to the value of the plants and to the costs of the assets and of the services connected with their maintenance until their maturity.

GFCF. On the other hand, trees can be cut before the end of their normal lifetime to be used for various ends (final consumption, intermediate consumption): this type of flow constitutes a negative GFCF.

b) GFCF in non agricultural products corresponds to acquisitions, net of transfers, by units of the agriculture branch of new or existing fixed assets, produced or imported from other branches (equipment, buildings), to the improvements made to non produced tangibles (irrigation, drainage of the land), net acquisitions of the intangible asset transfers and the costs connected with the transfer of the non produced assets (relating to the purchases of land).

Acquisition of assets, which are not intended for being used in the process of production of the branch, is excluded. In particular this is the case of the housing of the farmers and of their employees.

***Remark on the "production rights"** : Within the framework of Community or national policies of control of agricultural production, production quotas (or premiums) are fixed for various products (in particular milk and beet quotas, bovine and ovine premiums, compensation aid for the major crops, etc.). In general, one first fixes one overall limit per country, then the objective is reflected into individual quotas being binding on the producers, according to rules which can differ from country to country. In the French accounts these "production rights" are not considered as economic assets as defined in the ESA.*

The regulation of milk quotas makes it possible to illustrate this choice. In France there is not any market on these "production rights", since apart from the transfers of land, a large part of the trade forwarding by the national reserve is done free of charge (the transfers of milk quotas between producers, apart from the transfers of land, are prohibited). Moreover, the system of attributing quotas is linked to extremely complex rules, which make it difficult to determine who owns the rights. Under these conditions, one can consider that economically speaking there is no right of ownership by an institutional unit. A higher value of land for the units having milk quotas is noted only.

Quota's for other agricultural products are similar to that of milk quotas. In France there does not exist a free "quota" market.

Thus, in the French account this is not evaluated under the "production rights"² of gross fixed capital formation of agriculture.

² In some other Member States of the European Union, the regulation is markedly different and permits the existence of a genuine market which makes it possible to consider certain " production rights ", in particular the milk quotas, as economic assets. In the agricultural accounts of these countries, the acquisitions of these assets, net of the transfers, are entered in the GFCF of the branch.

1.2 GFCF excluding deductible VAT

The GFCF excluding deductible VAT is obtained by adding non-deductible VAT to the GFCF excluding VAT.

The general principles concerning VAT in agriculture are summarized in the chapter of intermediate consumption (cf. III.1).

The treatment of non-deductible VAT and of VAT under-compensation for GFCF is completely similar to what is done for intermediate consumption. Non deductible VAT on GFCF of the "agricultural" branch is evaluated from statutory rates of non-deductible VAT applied to all the taxable persons, whether they are indebted or not. In practice all the goods and services acquired for the purpose of GFCF are entirely deductible, except for private cars, for which a non-deductible VAT rate of 18.6% is applied.

The difference between theoretical VAT that non-debtors would have deduced if they were indebted, and the agricultural lump sum refund (FRG) represents the VAT under-compensation, which constitutes a tax on production (in uses of the generation of income account of the branch) insofar as the amount of the FRG is lower than this theoretical VAT. In the opposite case, the difference would be entered in "subsidies on production and costs", under resources of the generation of income account.

Table 1

Value of the GFCF of the "agriculture" branch, excluding VAT, 1990 to 1994

Specific agriculture account

	1990	Volume Index	Volume 91	Volume	1991	Volume Index	Volume 92	Volume	1992	Volume Index	Volume 93	Volume	1993	Volume Index	Volume 94	Volume	1994
Agricultural products	9007	73.7	6642	97.2	6457	104.0	6714	101.2	6793	90.2	6129	100.1	6133	104.8	6425	102.4	6581
cattle	3487	73.6	2566	86.9	2231	123.6	2758	107.1	2954	86.0	2539	102.4	2599	136.7	3554	102.1	3629
plantations	5520	73.8	4076	103.7	4226	93.6	3956	97.0	3839	93.5	3590	98.4	3534	81.2	2871	102.8	2952
Non agricultural products	43466	92.7	40279	104.2	41952	89.9	37723	101.9	38425	93.0	35752	100.1	35780	106.4	38064	101.4	38589
Equipment	29775	88.7	26404	104.2	27516	88	24216	102	24700	95.8	23662	99.5	23540	111.4	26228	101.8	26688
Buildings	12916	101.6	13118	104.3	13686	93.2	12760	101.9	13000	87.1	11324	101.6	11507	96.4	11089	100.7	11165
Other products	775	97.7	757	99.1	750	99.6	747	97.1	725	105.7	766	95.7	733	101.9	747	98.5	736
GFCF TOTAL Excluding TVA	52473	89.4	46921	103.2	48409	91.8	44437	101.8	45218	92.6	41881	100.1	41913	106.1	44489	101.5	45170

Unit : million francs

Source : **INSEE**

Note : values excluding VAT

Table 2

Value of the GFCF of the "agriculture" branch deductible, excluding VAT, 1990 to 1994

Specific account of agriculture

	1990	Volume Index	Volume 91	Volume	1991	Volume Index	Volume 92	Volume	1992	Volume Index	Volume 93	Volume	1993	Volume Index	Volume 94	Volume	1994
Agricultural products	9007	73.7	6642	97.2	6457	104.0	6714	101.2	6793	90.2	6129	100.1	6133	104.8	6425	102.4	6581
cattle	3487	73.6	2566	86.9	2231	123.6	2758	107.1	2954	86.0	2539	102.4	2599	136.7	3554	102.1	3629
Plantations	5520	73.8	4076	103.7	4226	93.6	3956	97.0	3839	93.5	3590	98.4	3534	81.2	2871	102.8	2952
Non agricultural products	43635	92.7	40435	104.1	42113	89.9	37860	101.9	38565	93.0	35868	100.1	35899	106.4	38189	101.4	38719
Equipment	29944	88.7	26560	104.2	27677	88	24353	102	24840	95.7	23778	99.5	23659	111.4	26353	101.8	26818
Buildings	12916	101.6	13118	104.3	13686	93.2	12760	101.9	13000	87.1	11324	101.6	11507	96.4	11089	100.7	11165
Other products	775	97.7	757	99.1	750	99.6	747	97.1	725	105.7	766	95.7	733	101.9	747	98.5	736
GFCF TOTAL HTVAD	52642	89.4	47077	103.2	48570	91.8	44574	101.8	45358	92.6	41997	100.1	42032	106.1	44614	101.5	45300
of which non deductible VAT (on D01)	169	92.8	156	103.1	161	84.9	137	102	140	83.2	116	101.5	118	105.9	125	103.4	130

Unit : million francs. Source : INSEE

Note : values out of deductible VAT

2. Consumption of fixed capital and the other entries of the account

2.1 General problems

The ESA 95 defines economic assets as *"entries functioning as a store of value over which ownership rights are enforced by institutional units, individually or collectively, and from which economic benefits may be derived by their owners by holding them or using them over a period of time. The economic benefits consists of primary incomes derived from the use of the asset and the value, including possible holding gains/losses, that could be realised by disposing of the asset or terminating it."*(ESA 95; § 7.10 and 7.11).

The acquisitions, net of transfers, of fixed assets constitute the Gross fixed capital formation (GFCF), which represents the annual flows of the inputs of capital assets used as production factors. Only the produced fixed assets are recalled in the GFCF ; the non-produced fixed assets (land, etc.) which also represent production factors, are excluded from it.

The capital account constitutes the computation scheme which provides a synthesis of the economic value of the produced fixed assets, making it possible "to reconcile" the elements of flows (the net or gross fixed capital formation) and the elements of stocks (the gross or net fixed asset). In particular, the capital account makes it possible to clarify the asset variations between two successive years.

The variation of the value of the gross fixed asset of the year n can be broken down into four elements: (1) the gross fixed capital formation of the year n, (2) the asset downgrading carried out during this year (to be deduced), (3) the other changes of volumes gross, occurred during the same year, (4) the other changes connected with the variations of prices, so called (gross) nominal holding gains:

$$\text{GFA (n) - GFA (n-1) = GFCF (n) - WITHDRAWALS (n) + OCVG (n) + GNDE (n).}$$

Similarly, the variation of the value of the net fixed asset of the year n can be broken down into four elements: (1) the gross fixed capital formation of the year n, (2) consumption of fixed capital (to be deduced), (3) the other net changes of volume and (4) the (net) nominal holding gains:

$$\text{NFA (n) - NFA (n-1) = GFCF (n) - CFC (n) + ONCV (n) + NNDE (n).}$$

The value of the gross fixed capital formation after deduction of consumption of fixed capital is called net fixed-capital formation (NFCF):

$$\text{NFCF (n) = GFCF (n) - CFC (n).}$$

2.2 Description of the entries of the capital account

Gross and net fixed asset

The produced assets described in the capital account are of two types: tangible non-financial fixed assets and intangible non-financial fixed assets. These assets are used in a repeated and continuous way in the production process during more than one year.

In the case of the "agricultural" branch, they are made up, on the one hand, of agricultural products, orchard and vineyard plantations and animals used for the purpose of production for several years (reproducers, slag, draft animals etc) and, on the other hand, for the purpose of non agricultural products, machines and equipment and buildings and works of civil engineering. The intangible non-financial fixed assets are made up, in the case of the "agricultural" branch, of computer software, the amount of which is relatively modest. Land and financial assets, such as the means of payments, the financial claims, etc. are not included in the capital account, but are incorporated into the balance sheets in addition to the non financial produced assets (fixed assets).

The value of gross fixed assets is evaluated as if assets were acquired in their state of origin at the time of establishment of the account. The latter are recorded at purchasers price if they are bought and at the basic price if they are produced on own account (in the case of plantations and animals). The value is therefore not at replacement cost.

However, to take into account the loss of effectiveness over time and to have a representative measure of the expenditure of the fixed asset, it would be advisable to estimate these elements. The value of the net fixed asset, which corresponds to the value of the capital is also determined excluding the depreciation linked to the use or the obsolescence.

Consumption of fixed capital

The annual depreciation connected with the use of the capital and with its obsolescence is called consumption of fixed capital. It is thus defined by the ESA 95: *"represents the amount of fixed assets used up ,during the period under consideration, as a result of normal wear and tear and foreseeable obsolescence, including a provision for losses of fixed assets as a result of accidental damage which can be insured against. Consumption of fixed capital must be calculated for all fixed assets, including both tangible fixed assets and intangible fixed assets such as the mineral exploration cost and software, major improvements to non produced assets and costs of ownership transfers associated with non-produced assets"* (ESA 95; § 6.02 and 6.03).

Thus, consumption of fixed capital of the "agricultural branch is evaluated for orchard and vineyard plantations, agricultural equipment, farm buildings, drainage and irrigation work and costs of transfers of agricultural³ land ownership. With regard to animals recorded in fixed asset, one should in theory evaluate, as for the other assets, fixed asset consumption, corresponding to a measure of the anticipated fall of the productive effectiveness of the animals used as production factors. However, numerous practical difficulties make the evaluation of consumption of fixed capital for this type of asset particularly delicate. Indeed, the depreciation in terms of productivity and of economic value is connected with the age of the animal, but is not a direct, regular and continuous phenomenon, as is implicitly the case for a normal depreciation. Moreover, the withdrawal of animals of the production herd can depend on the economic environment (development of market conditions, in particular of supply and demand in meat, of production prices, of cost of food etc). Thus, it was considered that consumption of fixed capital calculation for animals could only be calculated in a very artificial way and relatively disconnected of the economic reality, especially for the affected years of strong perturbations of the market.

In the production account of the "agricultural" branch, consumption of fixed capital is deduced from the "gross" balance (gross value added) to obtain the "net" balance recorded in (the net value added). The balances of the two following accounts, the generation of income account and the entrepreneurial income account are then also presented in "net" : the net mixed income and the net entrepreneurial income.

In the capital account, the valuation of gross fixed capital formation of the year n , which represents the value of acquisitions minus the transfers, is not enough to appreciate the increase in capital: the consumption of fixed capital of the gross fixed capital formation is deduced to determine the net fixed-capital formation and be able to measure the net growth of the capital between $n-1$ and n

Withdrawals

Withdrawals represent the exits of fixed asset stock, as a result of wear or of normal obsolescence. They correspond to some extent to the "death" of the gross capital and have to be deduced from the gross fixed capital formation at the time of the evaluation of the change in *gross* capital stock between the periods $n-1$ and n . The withdrawals should be distinguished from that of consumption of fixed capital, which corresponds to the depreciation of the net capital and which is deduced from the gross fixed capital formation to evaluate the change in *net* capital stock between n and $n-1$. Withdrawals are recorded at the time of the disposal of the corresponding asset while consumption of fixed capital is measured throughout the period of use.

It should be noted that stock exits due to exceptional events are not regarded as withdrawals, but as other changes in the volume.

³ It is recalled that the acquisitions of non-produced bodily assets, in particular the arable land, are excluded from the gross fixed capital formation.

The other changes of volume

The other changes of volume are *"flows with different functions. One important function is to allow certain assets to enter leave the system in the normal course of events - e.g. entrances and exits of naturally occurring assets. This is important for recording the discovery, depletion and degradation of natural assets. A second function is to record the effect of exceptional, unanticipated events that affect the economic benefits derivable from assets"* (ESA 95; § 6.15).

In the first case, they differ from the GFCF in the sense that it is not a question of exchanges between third parties; in the second case, they differ from the CFC and from the withdrawals in the sense that they result from unforeseen exceptional events.

In particular, the exceptional slaughters of animals victims of an epidemic outbreak are not deduced from the gross fixed capital formation when they are recorded in fixed asset stocks: these slaughters are recorded in other changes of volumes⁴. Similarly, the exceptional grubbing-up of orchard or vineyard plantation, in particular within the framework of a policy of reduction of supply, are also regarded as other changes of volumes.

Note: *the aid aiming to compensate for the financial losses connected with exceptional withdrawals, of the type of the previous examples, is recorded as "other capital transfers" when they correspond to other change of volume⁵.*

Finally, let us point out that changes due to disasters and phenomena of an exceptional nature (earthquakes, volcanic eruptions, hurricanes, floods, forest fires, etc.), also affecting the economic charge of an asset, can also be recorded in the other changes of volumes.

Nominal holding gains

Nominal holding gains *"are that category of other changes in the value of assets, liabilities, and therefore the worth which reflects the changes in the level and structure of their prices. The nominal holding gain on a given quantity of an asset is defined as the change in value for the owner of that asset as a result of change in its price"* (ESA 95; §6.35 and 6.36). A holding gain can be either positive, or negative (this involves then a loss of detention).

2.3 Evaluation method

The value of the gross fixed capital at a given date can be estimated by cumulating the values of the entries minus the exits over the whole of the previous periods at that date, counted from the date of the creation of the unit (or of a rather distant date so that the weight of the elements which could have been acquired as from this time is negligible and not to be downgraded meanwhile). In the same way, one can

⁴ In the case of animals recorded in work in progress, these slaughters have on the other hand to be deduced from production.

⁵ They are recorded in "subsidies on production and costs" when the value of the destroyed asset is deduced from production.

estimate the value of the net capital by cumulating the values of the entries minus depreciation. The absence of statistical data on the withdrawals and the depreciations, is an indirect method, i.e. a chronological method where withdrawals and depreciation are deduced from the entries based on the laws of mortality depreciation of equipment. This method is known under the name Perpetual Inventory Method⁶. This method requires amounts of the gross fixed capital formation in value and in volume and of data on the parameters of lifetime (average lifetime, divergences-type and maximum lifetime).

2.3.1 The successive stages of the evaluations

Evaluations are initially carried out in volume⁷. The data in value is then deduced from it using the⁸ gross fixed capital formation price indexes. The various follow-up stages to evaluate the various elements of the capital account in volume are as follows.

- The **gross fixed capital** in volume represents capital stock at a given date, i.e. the total of the still exploited capital assets. It is determined from the GFCF in volume and from the survival coefficients of the asset:

$$GFA_t = \sum_{j=0}^m I_{t-j} \cdot S_j$$

where:

GFA_t = gross capital stock (end of the year t)

m = maximum lifetime of the capital

I_{t-j} = Gross fixed capital formation of the t-j year (GFCF)

S_j = survival coefficients

t = year of the calculation of capital stock (at the end of the year).

The survival coefficients are estimated on the basis of a lognormal distribution law. Indeed, the calculation of the capital for a given year does not concern only one asset, but the sum of several types of assets, whose lifetimes are characterized by survival functions. In such cases, lognormal distribution is generally robust. Indeed, this distribution allows, from the data on the parameters of lifetime (average lifetime, standard deviation and maximum lifetime), to make assumptions leading to a curve of the required type, i.e. representative of the law of mortality of the equipment concerned. This method leads to a maximum lifetime between 2 and 3 times the average lifetime.

⁶ It was developed by Jacques Mairese; cf. "The evaluation of the productive-methods fixed asset and results"; Collection C of the NESSI, n°18-19,1972.

⁷ At constant 1990 prices for the period 1990-1994.

⁸ The annual price indexes for flows are taken up again (downgradings and consumption of fixed asset) and a geometric mean of two successive annual price indexes for fixed asset stocks is carried out.

The lognormal distribution is given by the density function:

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} \cdot \frac{1}{x} \cdot \exp\left(-\frac{1}{2\sigma^2}(\ln x - \mu)^2\right)$$

with:

μ = average of lognormal distribution

σ = standard deviation of lognormal distribution

- The annual **withdrawals** which represent the exits of capital stock are thus evaluated:

$$\text{DOWNG}_t = \sum_{j=0}^m I_{t-j} \cdot D_j$$

where the withdrawals D_j coefficients are obtained using the ageing factors S_j : they express the annual last or present investment-downgrading rate:

$D_t = S_{t-1} - S_t$ the rate of withdrawals of an asset purchased in the past or at present

- **Consumption of fixed capital** in volume is then deduced from it:

$$\text{CFC}_t = \sum_{j=0}^m I_{t-j} \cdot C_j$$

where the consumption of fixed capital coefficients C_j , which express the annual rate of depreciation of past or present investment, are defined as the product of the vector of the coefficients of D_j and of an inverse matrix of the utilisation period, based on the hypothesis of linear depreciation, i.e. one distributes the value to be depreciated equally over all the probable duration of the use of capital:

$$\begin{pmatrix} C_0 \\ C_1 \\ \vdots \\ \vdots \\ C_m \end{pmatrix} \begin{pmatrix} 1 & 1/2 & 1/3 & \dots & 1/m+1 \\ 0 & 1/2 & 1/3 & \dots & 1/m+1 \\ 0 & 0 & 1/3 & \dots & 1/m+1 \\ \vdots & \vdots & \vdots & \dots & \vdots \\ 0 & 0 & 0 & \dots & 1/m+1 \end{pmatrix} =^* \begin{pmatrix} D_0 \\ D_1 \\ \vdots \\ \vdots \\ D_m \end{pmatrix}$$

Since the sum of each column of the matrix is worth 1, one has $\sum_{j=0}^m C_j =$.

$\sum_{j=0}^m D_j$ Coefficients C_j are smoothings of the coefficients D_j .

- The **net capital** in volume at the end of the year is then thus defined: $NFA_t = \sum_{j=0}^m I_{t-j} \cdot N_j$ where the ageing factors in net value, N_j , are calculated from the coefficients C_j : $N_T = 1 - C_0 - C_1 - \dots - C_t$

Coefficients N_j express the share of the non-depreciated capital of past or present investment.

Then the following calculations are done:

$$\begin{aligned} GFA_t &= GFA_{t-1} + I_t - DOWNG_t \\ NFA_t &= NFA_{t-1} + I_t - CFC_t \end{aligned}$$

- The first equation enables us to initialise the first value of the withdrawals D_0 coefficients.

$$GFA_t = GFA_{t-1} + I_t - DOWNF_t$$

$$\Rightarrow \sum_{j=0}^m I_{t-j} \cdot S_j = \sum_{j=0}^m I_{t-1-j} \cdot S_j + I_t - \sum_{j=0}^m I_{t-j} \cdot D_j$$

$$\Rightarrow [I_t \cdot S_0 + I_{t-1} \cdot S_1 + \dots + I_{t-m} \cdot S_m] = [I_{t-1} \cdot S_0 + I_{t-2} \cdot S_1 + \dots + I_{t-1-m} \cdot S_m] + I_t + [I_t \cdot D_0 + I_{t-1} \cdot D_1 + \dots + I_{t-m} \cdot D_m]$$

$$\Rightarrow [S_0 \cdot I_t + S_1 \cdot I_{t-1} + \dots + S_m \cdot I_{t-m}] = (1-D_0) \cdot I_t + (S_0 - D_1) \cdot I_{t-1} + \dots + (S_{m-1} - D_m) \cdot I_{t-m} + I_{t-1-m} \cdot S_m$$

$$\xrightarrow{\text{d'où}} \begin{aligned} S_0 &= 1 - D_0 \\ S_1 &= S_0 - D_1 \\ &\vdots \\ S_m &= S_{m-1} - D_m \end{aligned}$$

The survival factor S_0 being necessarily of 1, it comes $D_0 = 0$

Moreover, the survival factor is pointless as from the year of maximum life m of the capital ($S_{m+i} = 0$ for $i \geq 0$) and consequently the coefficient D_m is equal to S_{m-1} .

- The second equation makes it possible to demonstrate the definition of **consumption of fixed capital**.

$$NFA_t = NFA_{t-1} + I_t - CFC_t$$

$$\Rightarrow \sum_{j=0}^m I_{t-j} \cdot N_j = \sum_{j=0}^m I_{t-1-j} \cdot N_j + I_t - \sum_{j=0}^m I_{t-j} \cdot C_j$$

$$\Rightarrow [I_t \cdot N_0 + I_{t-1} \cdot N_1 + \dots + I_{t-m} \cdot N_m] = [I_{t-1} \cdot N_0 + I_{t-2} \cdot N_1 + \dots + I_{t-1-m} \cdot N_m] + I_t \cdot [C_0 + I_{t-1} \cdot C_1 + \dots + I_{t-m} \cdot C_m]$$

$$\Rightarrow [N_0 \cdot I_t + N_1 \cdot I_{t-1} + \dots + N_m \cdot I_{t-m}] = (1-C_0) \cdot I_t + (N_0 - C_1) \cdot I_{t-1} + \dots + (N_{m-1} - C_m) \cdot I_{t-m} + I_{t-1-m} \cdot N_m$$

$$\xrightarrow{\text{d'ou}} \begin{aligned} N_0 &= 1 - C_0 \\ N_1 &= N_0 - C_1 \\ &\vdots \\ N_m &= N_{m-1} - C_m \end{aligned}$$

I.e. $C_j = N_{j-1} - N_j$: consumption of fixed capital at a given date j corresponds to the loss/gain of value of the net capital between the $j-1$ date and the j . date

The two following tables make it possible to summarise the step to follow for the evaluations in volume and in value (in addition to the elements from which the computation previously described, they also incorporate the other steps of volume which are exogenous data to the system):

Table 3. Construction of the tables of the capital account for the values in constant prices

VOLUME AT CONSTANT PRICES	year n
Gross fixed asset	Σ GFCF* Coefficients S + other changes of gross volumes
Gross fixed capital formation	Exogenous data
Gross Fixed asset downgrading	Σ GFCF* COEFFICIENTS D
Other Changes of Volumes gross	value in current/year n * 100 price index prices
Nominal earnings/Losses of Crude Detention	0
Net fixed asset	Σ GFCF* Coefficients N + other changes of net volumes
Net Fixed-capital formation	GFCF – consumption of fixed capital
Consumption of fixed capital	Σ GFCF* COEFFICIENTS C
Other Changes of Volumes net	value in current/year n * 100 price index prices
Nominal earnings/Losses of Detention net	0

- price index = 100 * GFCF in current/GFCF prices in constant prices

Table 4. Construction of the tables of the capital account for the values in current prices

VALUES AT CURRENT PRICES	year n
Gross fixed asset	value in constant prices * geometric mean of the price indexes of the year n and n+1/100
Gross fixed capital formation	Exogenous data
Gross Fixed asset downgrading	value in constant prices * year n/100 price index
Other Changes of Volumes gross	Exogenous data
Nominal earnings/Losses of Crude Detention	gross fixed asset of the year n - gross fixed asset of the year (n-1) - GFCF of the year n + withdrawals of the year n - other changes of gross volumes-of the year n
Net fixed asset	value in constant prices * geometric mean of the price indexes of the year n and n+1/100
Net Fixed-capital formation	value in constant prices * year n/100 price index
Consumption of fixed capital	value in constant prices * 100/index of the year n prices
Other Changes of Volumes net	Exogenous data
Nominal earnings/Losses of Detention net	net fixed asset of the year n - net fixed asset of the year (n-1) - NFCF of the year n - other changes of net volumes of the year n

- price index = 100 * GFCF in current/GFCF prices in constant prices

Notes:

- The other changes of volume constitute an exogenous criterion to the model. The amount recording in this entry of the account is irregular since they correspond primarily to exceptional asset withdrawals.

- In the case of the fixed assets in animals, the development of the account is relatively simplified since consumption of fixed capital is not evaluated. In addition to the gross fixed capital formation which is an exogenous piece of data (as for all the assets), the amount of gross fixed asset is determined directly from the value of the animals present in livestock at the end of each year (developed by the GFCF price at the end of the year) from which the culling discount⁹ is cut off. The earnings (or losses) nominal of detention are then deduced from it.

2.3.2 The determination of the parameters

In the model at constant prices, entries and exits correspond primarily to the flows of Gross fixed capital formation, to the withdrawals of productive equipment and to fixed asset consumption. Withdrawals, and consequently (as was previously seen) fixed asset consumption and gross and net capital stocks are obtained from entry flows, by means of certain hypotheses concerning the mortality law of these flows: average and standard deviation, or average and scatter coefficient. It is therefore necessary, based on observations by experts, to define as precisely as possible these parameters in order to decrease as much as possible the approximation of the calculation.

A. Estimate of the parameters of lifetime

a) Orchards

A study¹⁰ carried out by Technical Joint Trade Committee for fruit and vegetables analysed in detail the six predominant orchards in France concerning apple trees, pear trees, peach trees, plum trees, apricot trees and cherry trees, and to estimate average lifetimes for several development scenarios.

⁹ The evaluation of the culling discount is defined in the chapter concerning the production of cattle.

¹⁰ Technical Joint Trade Committee for Fruit and Vegetables-Reports, 1990 : "French fruit-bearing uses". Technical Joint Trade Committee for Fruit and Vegetables-Studies, 1990 : "The European orchard, tendencies of the production potential 87/92" and "the French orchard, tendencies of the production potential 87/97".

Table 5. Parameters of lifetime estimated in the Technical Joint Trade Committee for fruit and vegetables' study (1990)

Orchard	Average lifetime estimated in the Technical Joint Trade Committee for fruit and vegetables' scenarios	Maximum age estimated in the Technical Joint Trade Committee for fruit and vegetables' study
Apple tree	19.5	40
Pear tree	24	55
Fish	14	30
Apricot tree	18.5	40
Cherry tree	29	70
Plum tree	23	55

In the evaluation of the GFCF relating to the orchards, apricot trees, plum trees and cherry trees are not separately distinguished but are gathered in an aggregate "other fruit trees". For the capital account, it is advisable therefore to consider average parameters for these three categories of orchards. The plum tree orchards dominate, in France in terms of land area, followed by those of cherry trees and of apricot trees (see table 6).

Table 6. Land areas of three categories of fruit trees

Year	Apricot tree	Plum tree	Cherry tree
1977	16561 ha	18698 ha	22587 ha
1982	11279 ha	19656 ha	15922 ha
1987	12106 ha	18271 ha	13948 ha

Moreover the parameters concerning the plum tree (average lifetime 23 years and maximum age 55 years) are located exactly in the average of the parameters of the cherry trees and apricot trees. Finally, it an average lifetime of 23 years for the heading "other fruit trees" was estimated.

b) Vineyards

According to the INRA¹¹ , it is advisable to differentiate the vineyards of classified wines and of local wines, from the other vineyards. The former have a longer lifetime which can be fixed at 30 years on average and at 60 years maximum, while the latter, from their less quality, are composed of vines more frequently replaced. Their lifetime perhaps be considered at 25 years on average and at 50 years greatest.

Finally and in view of the constraints of the lognormal law, the exact values retained for the orchard and vineyard plantations are summarised in table 7.

¹¹ INRA. Laboratory for research in Montpellier. experimental unit of Pech-Rouge oenology

Table 7. Parameters of lifetime estimated for the plantations for the reappraisal of the capital account

PLANTATIONS	Average lifetime	Maximum lifetime	Average lifetime estimated in the old base
Apple trees	20	40	30
Pear trees	24	48	30
Peach trees	14	31.5	18
Other fruit trees	23	46	30
Grape vine	25	50	40
Champagne	30	60	40
Burgundy	30	60	40
Alsace	30	60	40
Loire-Atlantique	30	60	40
Vineyards for quality wine psr	30	60	40
Cognac	30	60	40
Vineyards for wine	25	50	40

c) The equipment

The standards recommended by the FADN¹² (Farm accountancy data Network) for data on average lifetime for the agricultural equipment, are shorter than those which had been retained at the time of the previous estimates on the matter, which go up in the middle of the 1970s. The latter seem particularly high, but, in view of the lifetimes estimated for the other branches, it seems moreover that those of the FADN are underestimated slightly, though certainly closer of current reality.

Table 8. Parameters of minimum and maximum lifetime for the average lifetime of the equipment

EQUIPMENT	Minimum average lifetime (given FADN)	Maximum average lifetime (old base)
Metal hangar	No value	29
Greenhouse equipment	10*	10*
Engines	10	18
Handling equipment	11	22
Tractors	10	18
Other equipment	12	20
Means of transport	10	22

* the data is identical because the value of the old base used the FADN piece of data.

¹² FADN, INSEE and SCEES, regulation N° 118 - 66 - EEC

Finally, the parameters selected are summarised in table 9.

Table 9. Parameters of lifetime estimated for the equipment for the reappraisal of the capital account

EQUIPMENT	Average lifetime	Maximum lifetime
Metal hangar	22	44
Greenhouse equipment	12	24
Engines	12	24
Handling equipment	14	31.5
Tractors	12	24
Other equipment	14	31.5
Means of transport	12	24

d) Buildings

The use of buildings in the agricultural activities shows characteristics, which do not make it possible to base the estimates of their lifetime on those of the other branches of activity. Indeed, the majority of the studies in the other sectors of activity give an average lifetime of 40 years for the buildings. But in view of technological progress achieved in the agricultural building and in view of the diversity of the types of construction and of the materials used, it is advisable to retain much lower values. Thus, the lifetimes, compared to past estimates in the old base, have much lower values which, as for the other products already given, appeared overestimated for the current accounts. The information, which could be gathered based on opinions of experts goes in this direction and leads to the data shown in table 10.

Table 10. Parameters of lifetime estimated for the buildings for the reappraisal of the capital account

BUILDINGS	Average lifetime	old base	Maximum average lifetime
Cattle sheds, stables, sheep-folds	20	25-27	45
Pig units	15	19	37.5
Poultry units	16	20	36
Greenhouses	12	16	27
Other buildings	20	25	45
Drainage	12	15	24

e) The other products

For the computer hardware and software, one can consider that it is not necessary to introduce specific characteristics for the agricultural branch in relation to the other branches of activity. Regarding the cost of transfers of property, it is agreed by definition that consumption of fixed capital is carried out completely the same year as the gross fixed capital formation. This convention is also retained in Eurostat's Economic accounts for agriculture

Table 11. Parameters of lifetime estimated for the "other products" for the reappraisal of the capital account

OTHER PRODUCTS	Average lifetime	Maximum lifetime
Computer equipment	8	16
Software	6	12
Cost of transfer of property	0	0

B. Estimate of the standard deviations

Concerning the standard deviations of these products, it is noted that they are generally evaluated between 0.5 and 0.6 for the other branches of activities. One also finds these figures in the recommendations of a note¹³ of 1979 on the depreciation of agriculture. Here this band was extended to values less than 0.5. Indeed, it should be noted that with average and maximum lifetime identical, the larger the standard deviation, the larger the approximation given by the lifetime retained for calculation.

¹³ "The amortisements of agriculture", note submitted to the subcommittee of the accounts of Agriculture on 24 April 1979. Black and Viguier, division on agriculture of the INSEE.

Table 12. Ecart-types of the lifetime (expressed in years)

PLANTATIONS	Standard deviations
Apple tree	0.45
Pear tree	0.44
Fish	0.53
Other fruit trees	0.45
Vineyards	0.44
EQUIPMENT	Standard deviations
Metal hangar	0.45
Greenhouse equipment	0.48
Engines	0.48
Handling equipment	0.53
Tractors	0.48
Other equipment	0.53
Means of transport	0.48
BUILDINGS	Standard deviations
Cattle sheds, stables, sheep-folds	0.51
Pig units	0.57
Poultry units	0.52
Greenhouses	0.54
Other buildings	0.51
Drainage	0.48
OTHER PRODUCTS	Standard deviations
Computer equipment	0.52
Software	0.56
Cost of transfer of property	/

General remark on the lifetimes: *With the exception of orchards, the information available is relatively limited and fragmented. Estimates have on the whole been carried out on the basis of those of other branches of the economy, adjusted to take into account the agricultural specific characteristics. The lifetimes selected here could certainly be improved from complementary studies or from precise inventories. However, the opinions of experts make it possible to conclude that the lifetimes were overestimated in the old base of the accounts and that the agricultural specific characteristics require shorter lifetimes, in particular in the building. The lifetimes selected should not too much be moved away from reality, not sufficiently in any case to influence manifestly the results of the capital account.*

2.4 Summary tables from 1990 to 1994

The following tables present all the elements of the capital account for cattle, plantations, equipment, buildings, other products and finally total.

Table 13 Specific Account of agriculture. Capital account of the agricultural branch from 1990 to 1994. Cattle

	1990	1991	1992	1993	1994
Gross fixed asset	10996 8	10175 7	10361 6	10260 6	10579 4
Gross fixed capital formation	3487	2231	2954	2599	3629
Downgrading of the fixed asset					
Other gross changes of volume	- 3413	- 3188	- 3330	- 3356	- 3338
Gross nominal detention earnings	- 2168	- 7254	2235	- 253	2897
Net fixed asset	10996 8	10175 7	10361 6	10260 6	10579 4
Gross fixed capital formation	3487	2231	2954	2599	3629
Consumption of fixed capital					
Net fixed-capital formation	3487	2231	2954	2599	3629
Other net changes of volume	- 3413	- 3188	- 3330	- 3356	- 3338
Net nominal detention earnings	- 2168	- 7254	2235	- 253	2897

Units: values in million francs. Source: INSEE

Table 14 Specific Account of agriculture. Capital account of the agricultural branch from 1990 to 1994. Plantations

	1990	1991	1992	1993	1994
Gross fixed asset	75042	77090	76798	77716	83249
Gross fixed capital formation	5520	4226	3839	3534	2952
Downgrading of the fixed asset	2290	2390	2450	2430	2541
Other gross changes of volume	- 19	- 16	- 29		- 4
Gross nominal detention earnings	- 4790	228	- 1652	- 186	5126
Net fixed asset	40315	41611	41464	41887	44462
Gross fixed capital formation	5520	4226	3839	3534	2952
Consumption of fixed capital	2906	3020	3057	3018	3112
Net fixed-capital formation	2614	1206	782	516	- 160
Other net changes of volume	- 16	- 13	- 24		- 3
Net nominal detention earnings	- 2057	103	- 905	- 93	2738

Units: values in million francs. Source: INSEE

Table 15 Specific Account of agriculture. Capital account of the agricultural branch from 1990 to 1994. Equipment

	1990	1991	1992	1993	1994
Gross fixed asset	42184 9	42982 3	42459 9	41719 7	40933 7
Gross fixed capital formation	29944	27677	24840	23659	26818
Downgrading of the fixed asset	31903	33232	33803	33496	33837
Other gross changes of volume					
Gross nominal detention earnings	11617	13529	3739	2435	- 841
Net fixed asset	20759 4	21023 6	20526 1	19932 5	19505 2
Gross fixed capital formation	29944	27677	24840	23659	26818
Consumption of fixed capital	30806	31643	31591	30671	30637
Net fixed-capital formation	- 862	- 3966	- 6751	- 7012	- 3819
Other net changes of volume					
Net nominal detention earnings	5686	6608	1776	1076	- 454

Units: values in million francs. Source: INSEE

Table 16 Specific Account of agriculture. Capital account of the agricultural branch from 1990 to 1994. Buildings

	1990	1991	1992	1993	1994
Gross fixed asset	19316 9	20252 2	20836 9	21119 4	21246 5
Gross fixed capital formation	12916	13686	13000	11507	11165
Downgrading of the fixed asset	9797	10436	10832	11197	11467
Other gross changes of volume					
Gross nominal detention earnings	6540	6103	3679	2515	1573
Net fixed asset	10057 2	10554 1	10821 7	10860 8	10813 0
Gross fixed capital formation	12916	13686	13000	11507	11165
Consumption of fixed capital	11223	11895	12234	12420	12454
Net fixed-capital formation	1693	1791	766	- 913	- 1289
Other net changes of volume					
Net nominal detention earnings	3407	3178	1910	1304	811

*Units: values in million francs
Source: INSEE.*

Table 17 Specific Account of agriculture. Capital account of the agricultural branch from 1990 to 1994. Other products

	1990	1991	1992	1993	1994
Gross fixed asset	791	761	737	764	807
Gross fixed capital formation	775	750	725	733	736
Downgrading of the fixed asset	772	743	714	704	705
Other gross changes of volume					
Gross nominal detention earnings	13	- 37	- 35	- 2	12
Net fixed asset	780	747	720	741	772
Gross fixed capital formation	775	750	725	733	736
Consumption of fixed capital	774	745	717	711	717
Net fixed-capital formation	1	5	8	22	19
Other net changes of volume					
Net nominal detention earnings	13	- 38	- 35	- 1	12

Units: values in million francs

Source: INSEE.

Table 18 Specific Account of agriculture. Capital account of the agricultural branch from 1990 to 1994. Total

	1990	1991	1992	1993	1994
Gross fixed asset	80081	81195	81411	80947	81165
	9	3	9	7	2
Gross fixed capital formation	52642	48570	45358	42032	45300
Downgrading of the fixed asset	44762	46801	47799	47827	48550
Other gross changes of volume	- 3432	- 3204	- 3359	- 3356	- 3342
Gross nominal detention earnings	11212	12569	7966	4509	8767
Net fixed asset	45922	45989	45927	45316	45421
	9	2	8	7	0
Gross fixed capital formation	52642	48570	45358	42032	45300
Consumption of fixed capital	45709	47303	47599	46820	46920
Net fixed-capital formation	6933	1267	- 2241	- 4788	- 1620
Other net changes of volume	-	- 3201	- 3354	- 3356	- 3341
	3429				
Net nominal detention earnings	4881	2597	4981	2033	6004

Units: values in million francs

Source: INSEE.