

The food performance calculator "PerfAlim"



Methodological guide **(version 1)**

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CEREOPA – AgroParisTech (May 2011)

1. Principle and definitions of the farm's food performance concept

The food performance (or food potential) , calculated by PerfAlim, is the **maximum number of persons potentially fed by the farm annual deliveries**. This performance is calculated for each specific nutritional indicator as the ratio of the **annual food net balance** to the equivalent nutritional requirement of an individual. In the “annual food net balance”, food refers to all the edible agricultural commodities produced by the farm (*see section 2*).

Food performance (maximum number of persons fed by the farm deliveries) :

$$\frac{\text{Annual food net balance of the farm for the nutritional indicator } X}{\text{Daily requirement of an individual for a nutritional indicator } X \times 365}$$

Three nutritional indicators are considered to calculate the farm’s food performance : 1) **Energy** (in million calories or Mcal), 2) **Protein** (in kilograms) and 3) **Animal Protein** (in kilograms), considered as **high-value quality Protein** and as a **proxy of some important nutrients** mainly provided by animal products (calcium, iron, vitamin B12).

Thus, PerfAlim provides three types of results to evaluate the food performance of a farm :

<p><i>Food performance (maximum number of persons fed by the farm deliveries) :</i></p> $\frac{\text{Annual Energy net balance * of the farm}}{\text{Daily Energy requirement of an individual x 365}}$ <p>OR</p> $\frac{\text{Annual Protein net balance * of a farm}}{\text{Daily Protein requirement of an individual x 365}}$ <p>OR</p> $\frac{\text{Annual animal Protein net balance of a farm}}{\text{Daily animal Protein requirement of an individual x 365}}$

* The Energy net balance of a farm is Energy amount (expressed in calories) of its food net balance- or edible agricultural commodities - net balance. The (animal) Protein net balance of a farm is the quantity of (animal) Protein (expressed in grams) contained in its food net balance.

The three nutritional indicators described above cannot exhaustively define all the nutritional requirements of an individual. However, Energy, Protein and Animal Protein allow to assess representative and homogeneous levels of food performance. These indicators are also used by the FAO (Food and Agriculture Organization) as food consumption indicators for each country.

2. Calculating the food net balance of a farm

The **Energy/(animal) Protein net balance of a farm** is equal to the difference between Energy/(animal) Protein delivered to the food market, through the **delivered edible agricultural commodities (DEAC)**, and the Energy/(animal) Protein contained in **the purchased edible agricultural commodities (PEAC)**. The on-farm consumption commodities (livestock feeding), which are not valuable as human food, must not be taken into account.

<p><i>Food (Energy or -animal - Protein) net balance of a farm :</i></p> <p><i>For all i agricultural commodity, delivered Energy - Purchased Energy, of the farm (in Mcal/year)</i></p> $= \sum_i (\text{Energy content of DEAC}_i) - \sum_i (\text{Energy content of PEAC}_i)$ <p style="text-align: center;">Or,</p> <p><i>Delivered Protein - Purchased Protein, of the farm (in Kg/year)</i></p> $= \sum_i (\text{Protein content of DEAC}_i) - \sum_i (\text{Protein content of PEAC}_i)$ <p style="text-align: center;">Or,</p> <p><i>Delivered Animal Protein - Purchased Animal Protein, of the farm (in Kg/year)</i></p> $= \sum_i (\text{Animal Protein content of DEAC}_i) - \sum_i (\text{Animal Protein content of PEAC}_i)$
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This calculation involves that Energy and (animal) Protein contents - valuable for human food - must be described for each agricultural commodity (delivered or purchased) by the farm. Thus, calories and proteins contained in inedible (for human) forages, in energy crops or seed crops, must not be taken into account. It is also supposed that only the oil fraction of oilseeds are considered, the Protein fraction (oilseed meals) being generally dedicated to livestock feeding.

Furthermore, Protein and Animal Protein contents considered in PerfAlim, include a "nutritional efficiency" factor, resulting from :

- their capacity to be assimilated by the human organism (digestibility),
- their amino acid composition (chemical score of a Protein).

*The Energy/Protein content values of edible agricultural commodities, are extracted from the **FAO Food Balance Sheet** databases (2007, France). The "nutritional efficiency" of all vegetal Proteins (from cereals, pulses, fruits and vegetables) is estimated at a low average of 80%, according to the FAO report "**Protein and Energy Requirements**". The "nutritional efficiency" of all Animal Proteins (from meat, milk, eggs) is approximately equal to 95%. The nutritional efficiency concept is equivalent to the protein digestibility corrected amino acid score (PDCAAS) approach used by the FAO.*

The Energy/Protein contents of animal products are calculated considering hypotheses for the live weight and carcass yield of each animal category, extracted from various databases (Institut de l'Élevage, Uniporc, FranceAgriMer, SCEES). The estimation of unfinished animals considers their own live weight and the carcass yield of the equivalent fattened animal .

The Energy/Protein contents of compound feeds integrate raw materials incorporation levels calculated with Ariane (CEREOPA software), an optimization tool for feed formulas, taking into account the 2010 price conjuncture.

3. Assessment of Energy end Protein requirements

The **reference Energy and Protein daily requirements** considered in PerfAlim are those of a **typical 70-kg man**, of 70 Kg, and with a moderate physical activity. These daily requirements are estimated as **2700 Kcal of Energy and 52.5 g of high-quality Proteins**, equivalent to approximately **62 g of "total Proteins" contained in the food intake** (we can see here that the average "nutritional efficiency" factor for all vegetal and animal Proteins is about 85%).

Regarding the Animal Protein requirements, we considered a World average ratio of Animal Protein contained in the total Protein intake, **estimated at 40%**. Thus, it is considered in *PerfAlim* that the (high "nutritional efficiency" level) **Animal Protein daily requirements of an individual is equal to 22.5 g**.

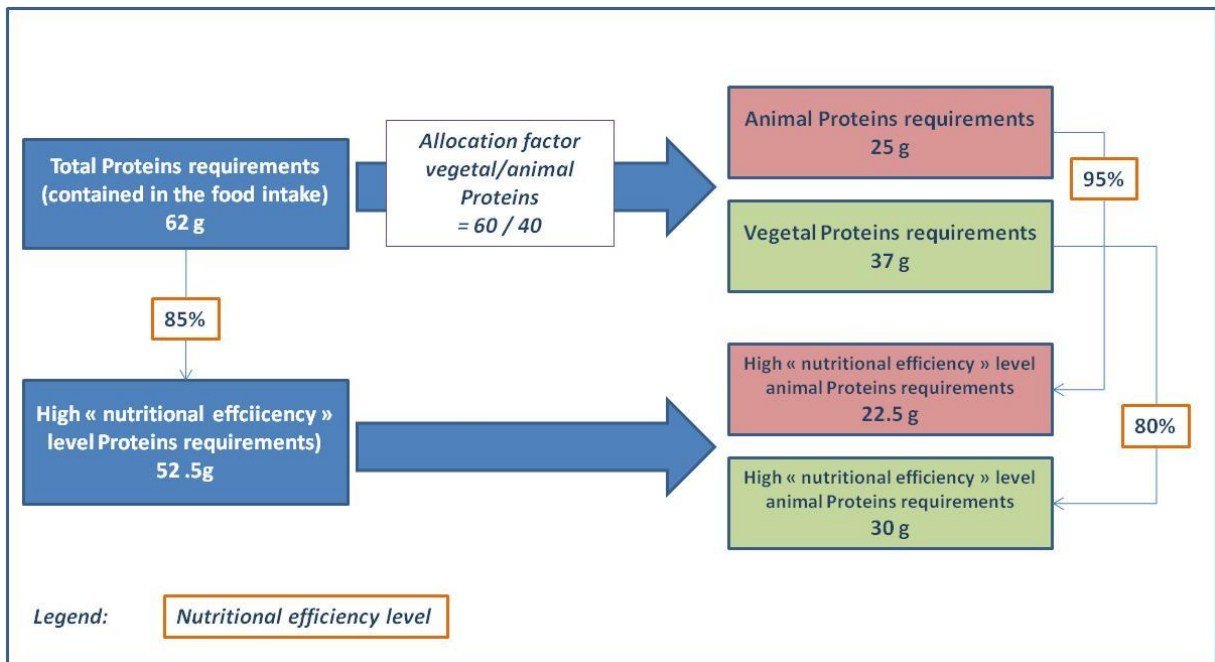


Figure 1 : Animal and vegetal Proteins requirement levels considered in PerfAlim

All the aforementioned hypotheses described are derived from FAO data. Regarding Energy and Proteins requirements are those found in the reference report **Protein and Energy Requirements**. The Animal protein requirements considered in PerfAlim are based on the hypotheses of the World animal/vegetal Proteins food intake given by the FAO Food Balance Sheet (2007, World).

4. Interpreting the results

As previously explained, the *PerfAlim* calculator leads to three different results representing the food performance of a farm, based on Energy, Protein and Animal Protein net balances. For one farm, these three results may be very different from each other. **They must be separately discussed** (and not summed or averaged). We recommend to *PerfAlim* users to **choose the food performance result to communicate, according to the type of farming system studied**.

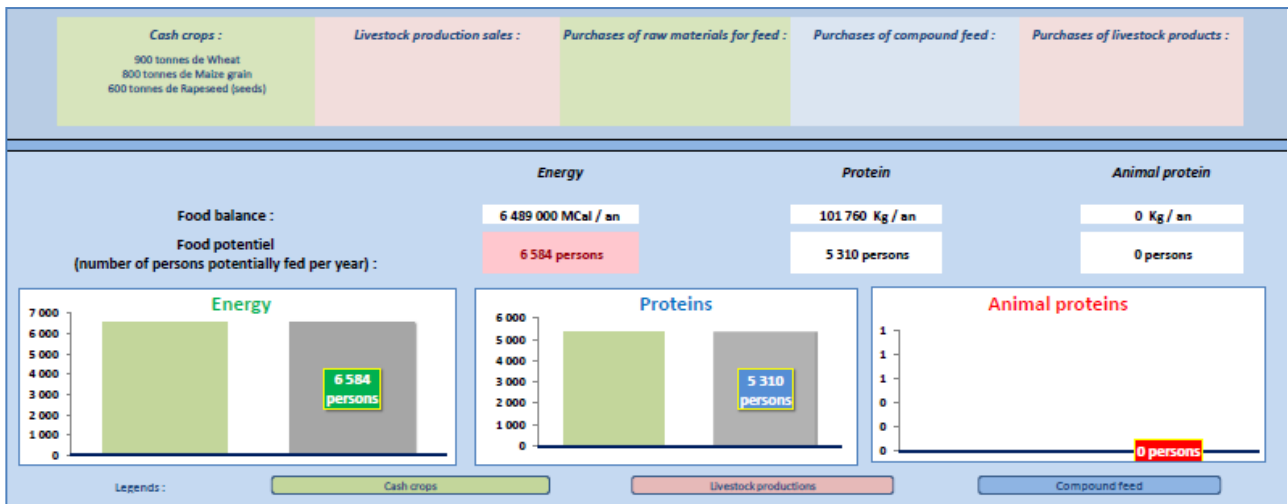


Figure 2 : An example of PerAlim results board, for a crop farm (no animal product)

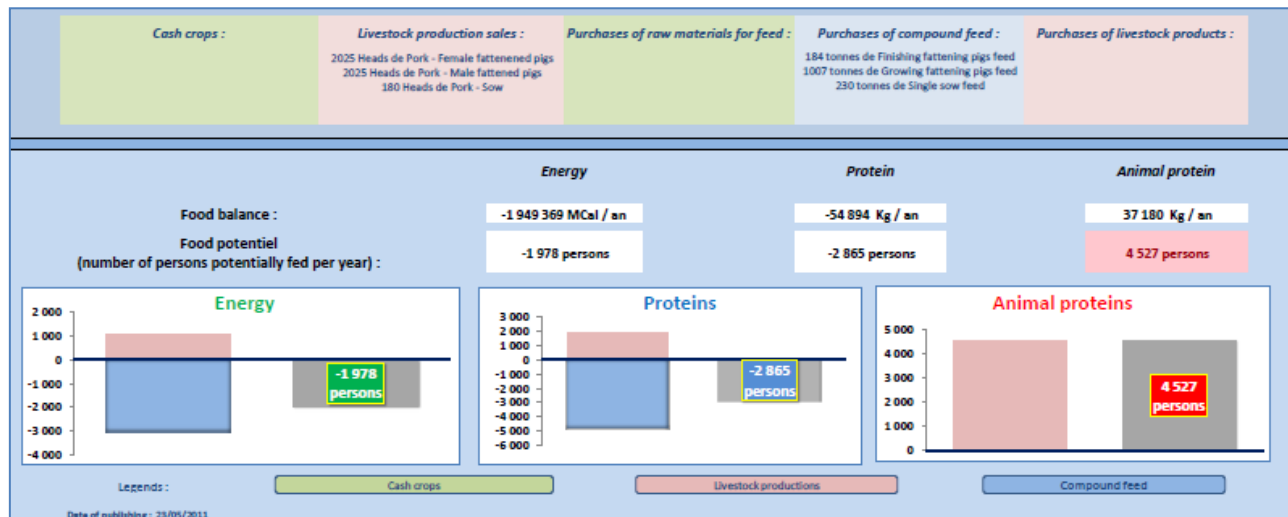


Figure 3 : Example of PerAlim results board for a breeder - fattener farm

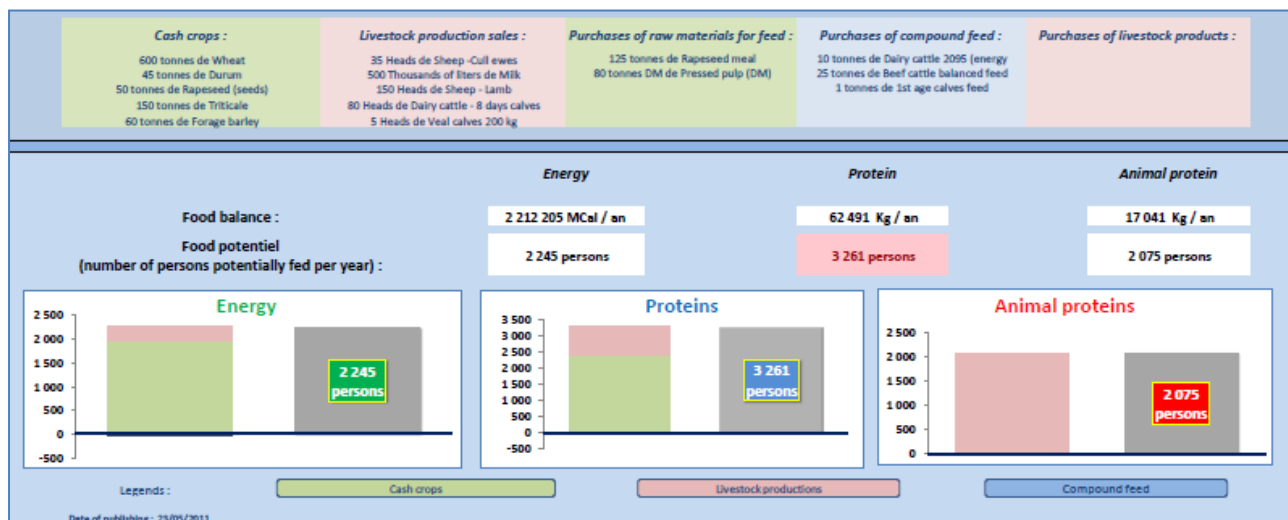


Figure 4 : Example of PerAlim results board for a crop-livestock farm

As shown in figures 2-4, the food performance profiles are really depending on the type of farming production. The PerfAlim objective is not to legitimize some models over others, which would be impossible because of the variability of contexts, but rather to underline **the possible complementarities of farming systems in a territory**. *PerfAlim* is also an efficient tool **to simulate the consequences of different production strategies** in terms of food performance.

It is crucial to keep in mind that *PerfAlim* calculates the **food potential** of farms. **The processing of agricultural commodities into processed food products (wheat into bread, milk into cheese, etc.) is not taken into account**. We valorize the edible fraction of farm deliveries, in their current state at the "farm step".

The stakes associated to *PerfAlim* diffusion are detailed in companion the document "***The farm food performance stakes***", downloadable from the *PerfAlim* website: <http://www.cereopa.com/fr/actions/perfalim.html>.

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