



**Brief introduction to the tool to evaluate feed rations for ruminants in the Sahel (Outil Pour
Évaluation et rationnement pour Ruminants Au Sahel)**

OPÉRAS (tool version 3.0)

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Description: This tool (Microsoft Excel®) has been developed in the frame of the SustainSahel project (Horizon 2020, Grant Agreement No 861974) to calculate balanced feed rations for sheep, goats, and cattle based on tree and shrub foliage. In total, 35 browse species are considered. For each animal group (adult males, young males, young females, lactating females, gestating females, other adult females – to be defined by the user), the energy and protein requirements are calculated on the basis of default values for the body weight, locomotion, growth, gestation, or lactation (only for cows), while for each feedstuff (leaves, roughage feed, concentrate feed), the default values for the nutritional composition are considered. Based on the animal's requirements, the quantity of each feed required to meet these requirements is calculated using the Excel solver and displayed. Costs are also calculated (cost per unit to be defined by the user).

How to use the tool

I. Title page: Launching the tool

After opening the Excel file, the tool's title page appears, from which the calculations are launched. For the calculations, the user has to enter various data, which the program automatically guides them through after clicking "[Launch tool](#)" (Fig. 1).

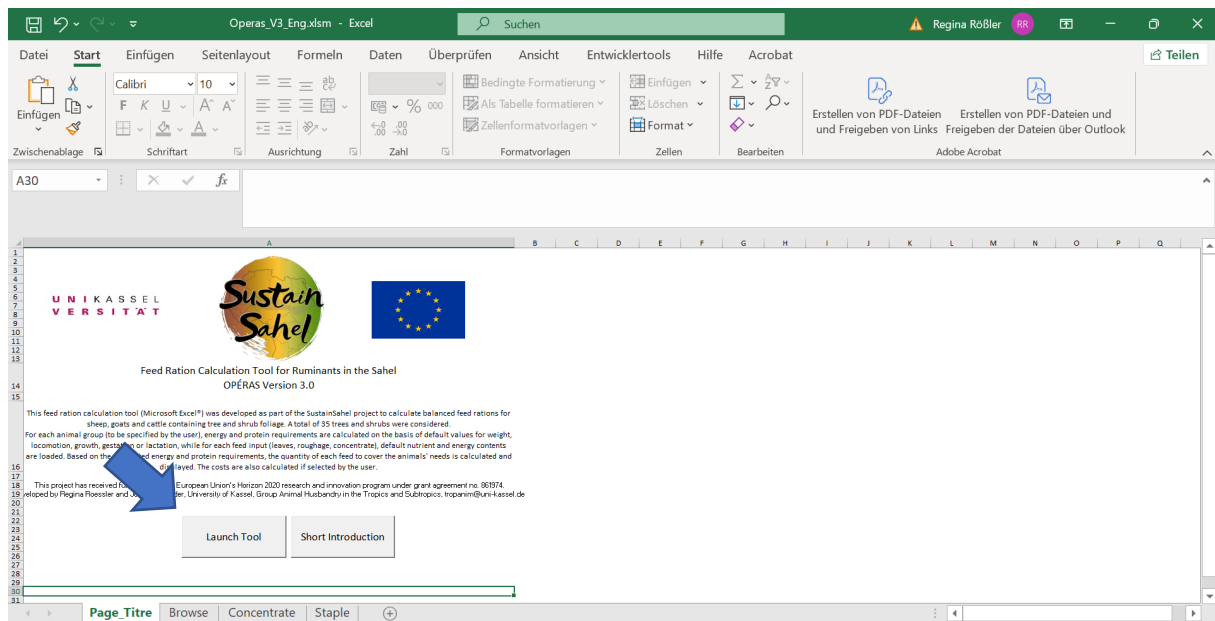


Figure 1: Launch of the OPÉRAS tool version 3.0 at the title page

2. Selection of the **ruminant livestock species** and entering the information for the animal group:

The user begins by selecting the animal species for which he/she wishes to calculate the feed ration (cattle, sheep, or goats). It is possible to perform calculations for a single group of a single ruminant species only (cattle, sheep, goats) (Fig. 2).

The user then selects the group for which the feed ration is to be optimized. Each species is divided into different groups according to age (young/adult), sex (male/female) and, for females, reproductive stage (non-pregnant/dry, lactating, pregnant) (Fig. 2).

Since weight, daily weight gain, milk production (currently only for cows), and locomotion determine the animal's energy and protein requirements, the user has to enter the following information:

- Number of animals in this group
- Average weight (in kg)
- Expected weight gain (in g/day)
- Distance traveled per day (in km)
- Milk production (only for cows)

Since this information is often unknown, default values are predefined for average weight, weight gain, and milk production for all groups, which can be used to perform calculations.

If the number of animals is equal to $n=1$, it is assumed that the animals are fed individually; if $n > 1$, it is assumed that the animals are fed in the group. The number of animals per group is taken into account to obtain the total quantities (sums) for each feed offered.

<p>For which species would you like to calculate a feed ration?</p> <p><input checked="" type="checkbox"/> Sheep</p> <p><input type="checkbox"/> Goats</p> <p><input type="checkbox"/> Cattle</p> <p style="text-align: center;"><input type="button" value="Next"/></p>	<p>What type of sheep do you have? Please check the corresponding box.</p> <p><input checked="" type="checkbox"/> Young Rams</p> <p><input type="checkbox"/> Adult Rams</p> <p><input type="checkbox"/> Young Ewes</p> <p><input type="checkbox"/> Dry, Non-Pregnant Ewes</p> <p><input type="checkbox"/> Pregnant Ewes</p> <p><input type="checkbox"/> Lactating Ewes</p>	<p>How many animals of each type do you have?</p> <p><input type="text" value="1"/></p>	<p>What is the average weight of your animals (kg)?</p> <p><input type="text" value="10"/></p>	<p>What is the average daily weight gain (g/d)?</p> <p><input type="text" value="50"/></p>	<p>What is the average distance travelled (km/d)?</p> <p><input type="text" value="3"/></p>
	<input type="button" value="Next"/>				

Figure 2: Selection of the ruminant livestock species and group for which the feed ration should be optimized, and provision of information for this group

3. Entering the information about available feed:

OPÉRAS was developed to optimize feed rations for ruminants. Three different types of feed are considered: dry leaves from trees and shrubs (n=35), staple feeds (n=18), and concentrated feed (n=22). The ration can be composed of all three types and a total of 3 different types of leaves, 3 different types of staple feed, and 2 different types of concentrate feed (Fig. 3). At least one basic feed must be defined. The nutritional values are predefined for each feed and do not need to be specified by the user, while the costs must be specified (optional calculation). After the user has made his or her selections, the ration will be calculated.

Young Rams

Choose the type of feed for the young rams. Please choose at least one staple feed.

Cost (optional), Unit/kg:

Browse Feed:	<input type="text" value="African rosewood"/>	<input type="text" value="5"/>
	<input type="text" value="Baobab"/>	<input type="text" value="5"/>
	<input type="text" value="Combretum aculeatum"/>	<input type="text" value="7"/>
Staple Feed:	<input type="text" value="Andropogon grass, fresh"/>	<input type="text" value="10"/>
	<input type="text" value="Please Choose..."/>	<input type="text" value="0"/>
Concentrate:	<input type="text" value="Please Choose..."/>	<input type="text" value="0"/>
	<input type="text" value="No Staple Feed"/>	<input type="text" value="0"/>
	<input type="text" value="Andropogon grass, fresh"/>	<input type="text" value="0"/>
	<input type="text" value="Millet husks"/>	<input type="text" value="0"/>
	<input type="text" value="Pearl millet hay"/>	<input type="text" value="0"/>
	<input type="text" value="Guinea grass hay"/>	<input type="text" value="0"/>
	<input type="text" value="Desho grass hay"/>	<input type="text" value="0"/>
	<input type="text" value="Wild grasses hay"/>	<input type="text" value="0"/>

Figure 3: Information on available feed (leaves, staple feed, concentrate feed)

4. Calculation (optimization) of the ration using the Excel solver

The calculation (optimization) of the ration is performed using the Excel solver according to the animals' energy and protein requirements and based on the available feeds and their nutritional values. If the optimization is successful, the required feed quantities and costs can be retrieved from the table displayed on the “[Output_Ration](#)” tab.

If no solution is possible because the selected feeds do not cover the animals' nutritional requirements, a message will be displayed. You can then modify your entries for the feeds or animal details.

5. Feedback

In the event that feeds are missing or there are errors with the solver, we request comments and the nutritional composition of these feeds at the following email addresses:

regina.roessler@uni-kassel.de et troanimals@uni-kassel.de