

Transition to a more sustainable diet: Insect-based protein (*Tenebrio molitor*)

INTRODUCTION

- The agri-food system is unsustainable and cannot meet the demand for food in a growing world population.
- The meat industry requires a lot of natural resources compared to vegetable protein and faces many challenges in terms of sustainability.
- Driven by the 2030 Agenda, the use of alternative proteins and in this case insect-based protein (*Tenebrio molitor*) as a sustainable substitute for conventional meats is proposed.

OBJECTIVES

- To study *Tenebrio molitor* protein as a viable alternative to animal protein.
- To assess whether the nutritional profile of protein obtained from *Tenebrio molitor* has a complete nutritional profile for human intake.
- Validate that *Tenebrio molitor* protein is a more sustainable protein source than proteins of animal origin.
- To propose a sustainable method of protein production from *Tenebrio molitor*.

STUDY

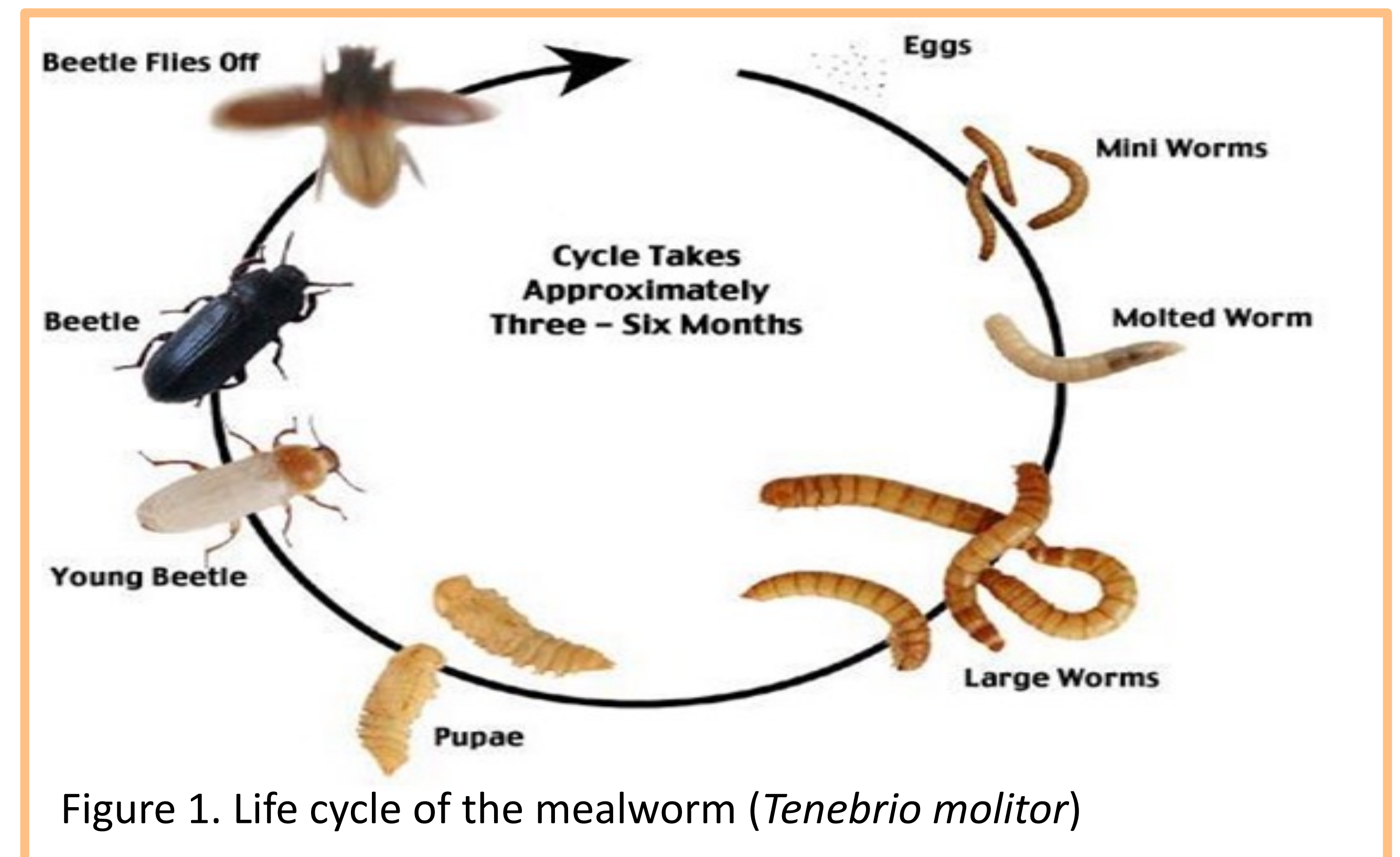
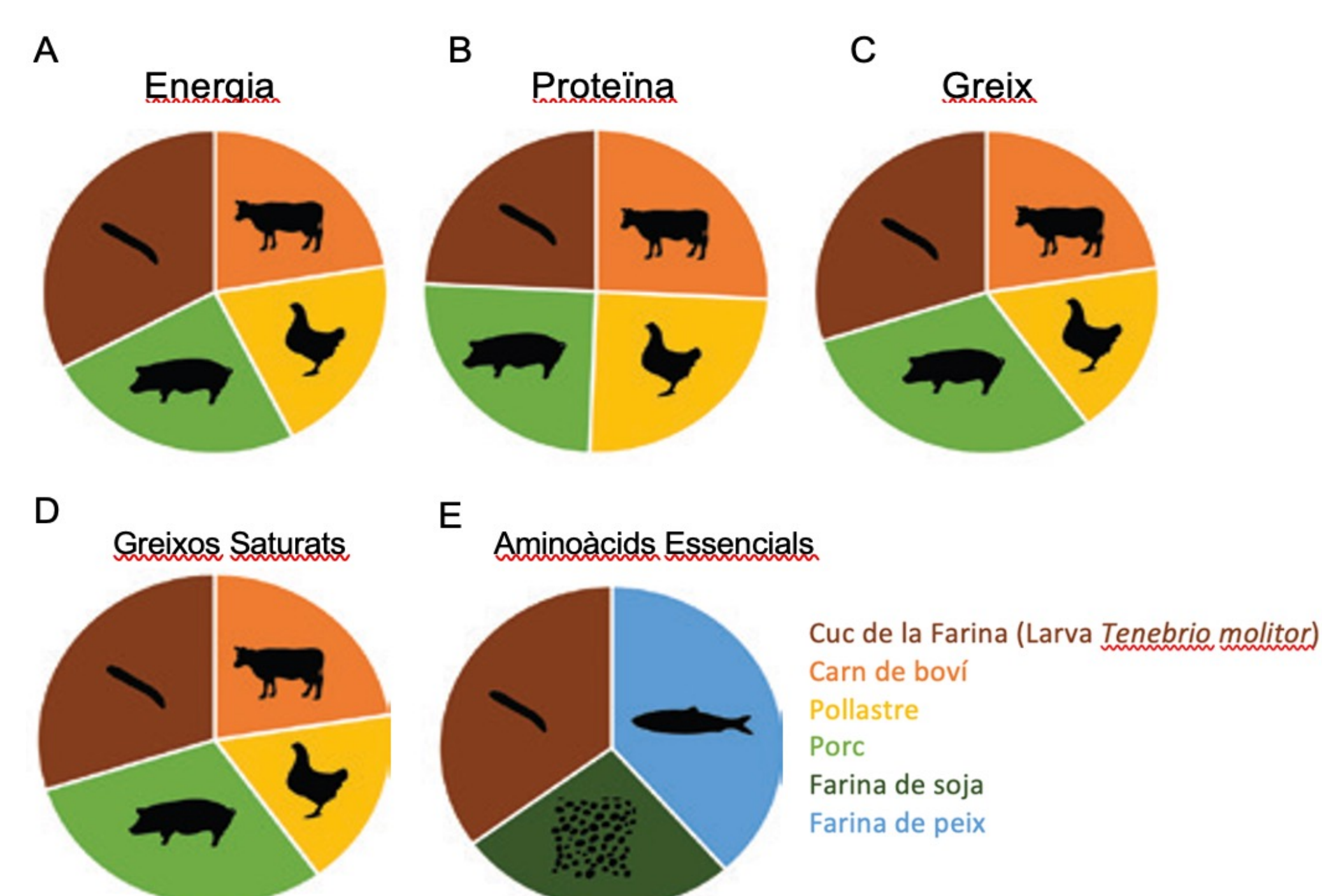


Figure 1. Life cycle of the mealworm (*Tenebrio molitor*)



(A-D) Nutritional value of 100g of an edible portion of mealworms compared to other animal carcasses.

(E) Comparison of the essential amino acids (EAA) of mealworms and classic foods such as soya and fish meal.

Figure 2: Nutritional and sustainable values of mealworms and conventional meats. Adapted and modified from (Grau et al. 2017).

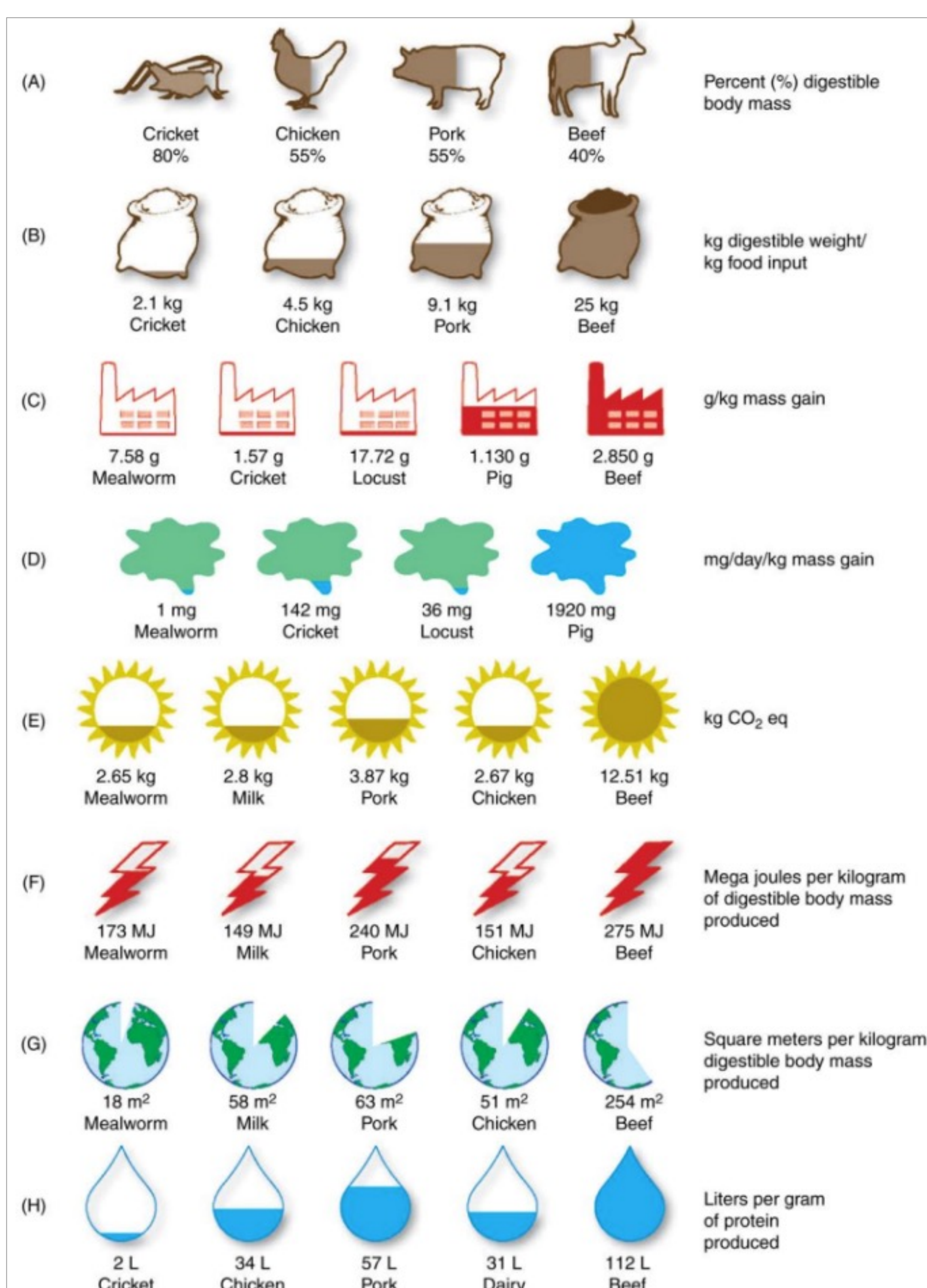
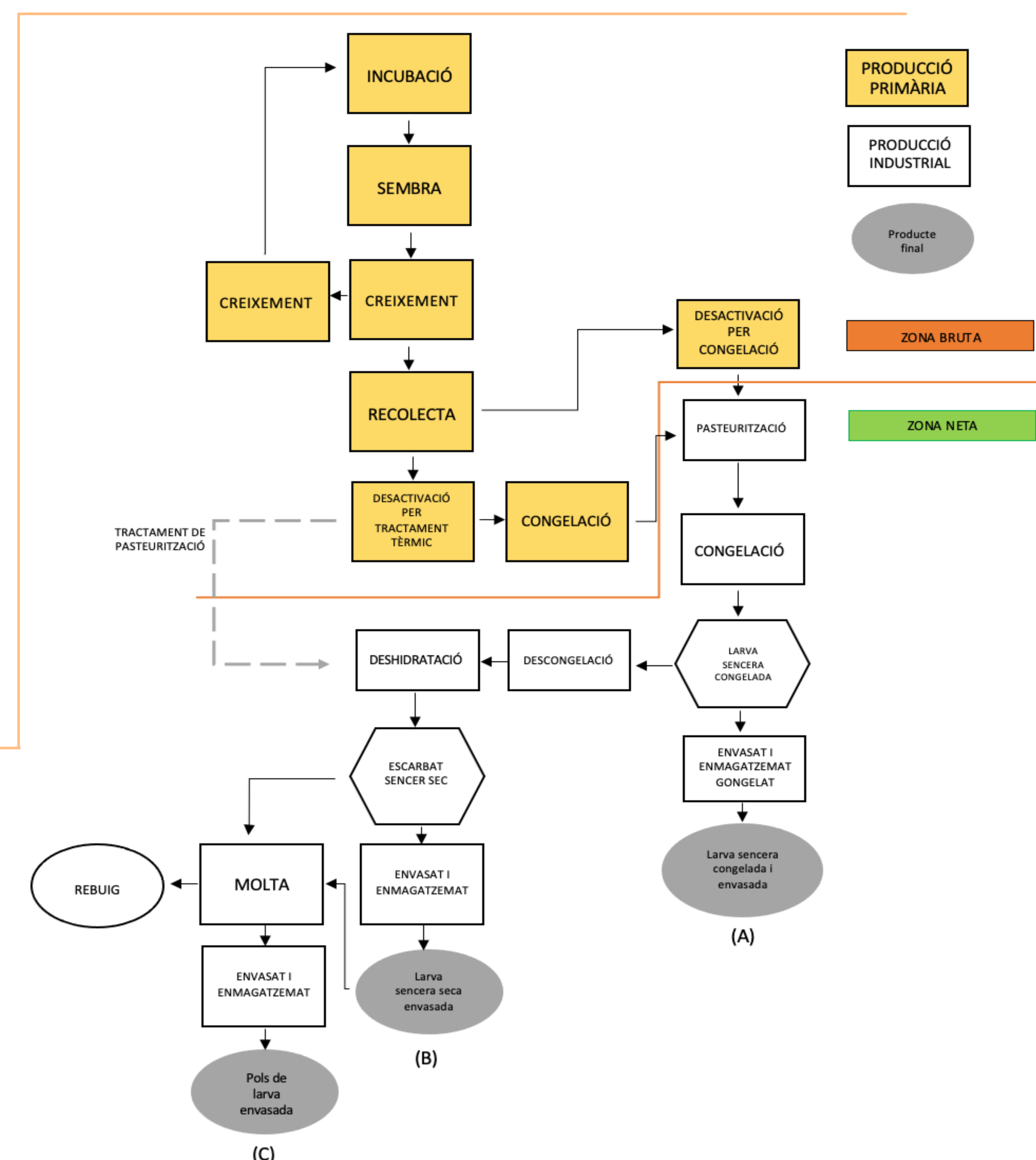


Figure 3. Resource use and environmental impact parameters of insect rearing versus conventional production.

- A: Percentage of digestible biomass
 - B: Feed conversion ratio
 - C: Greenhouse gas equivalent production per kg body mass gain
 - D: Ammonia pollution production per kg body mass;
 - E: Global warming potential
 - F: Energy use
 - G: Land use
 - H: Water use.
- Source: (Gahukar 2016).

Figure 4. General flow diagram corresponding to the processes involved in the primary and industrial production of *Tenebrio molitor* larvae for human consumption.

Source: Modified from (RSA-CONICET 2021).



CONCLUSIONS

- Need for a shift towards a more sustainable agri-food industry, with alternative proteins to reduce emissions and meet the Sustainable Development Goals.
- *Tenebrio molitor* larva: balanced nutritional profile, high in fat, protein, vitamins, fibre and minerals, as a substitute for conventional animal proteins.
- Production of *Tenebrio molitor* is more sustainable, requires fewer resources and generates fewer pollutant emissions than conventional meat.
- Advantages of *Tenebrio molitor*: efficient conversion of feed into biomass, short life cycle and high digestibility.