CS13 - Diary production, standards and competitiveness in global markets

MATS Deliverable 3.3

MATS
making agricultural trade sustainable

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Introduction

The MATS project aims to expand and enhance the available knowledge on the relationships between agricultural markets, trade, investments, policy, environmental sustainability, human well-being, and hence the SDGs. It intends to set a new benchmark in agricultural trade policy analysis to deliver novel solutions for the necessary sustainability transition. The EU Green Deal, as an example of a policy programme that aims at improving sustainability, represents both a challenge and an opportunity for agrifood imports for all countries, in differentiated ways. To turn this opportunity into reality the improvement of the design, governance, and implementation of trade policies and regimes are required all the way from private sector to national, EU, African and global levels.

As the core part of the MATS project, an integrated modelling framework was developed and applied to seven case studies. The impact of unsustainable practices, as well as the multidimensional gains emerging from improved sustainability have been identified and quantified. The results provide guidance for assessing the impact of sustainable agricultural trade policy at local, national, regional and global level, across a range of social, economic and environmental indicators.

CS13 – Milk (EU, Africa, America)[1]

The issue analysed is the sustainability of dairy production and the potential role of current and upcoming policies to increase sustainability. The methodology used for the creation of the Causal Loop Diagram (CLD) is called Systems Thinking (see Text Box 1). A CLD is a graphical representation of variables and their interconnections, giving shape to the dynamics of a given system (see Text Box 2).

The CLD is presented in Figure 1 and Figure 2, and was created as a team effort (Research Centre on Animal Production & KnowlEdge SRL), founded on co-creation (with a step by step, participatory approach).

At the beginning of the CLD creation process, we have analysed the dynamics that determine the total cost of production of dairy products. At first we focused on the labor costs, in relation to salaries, as a key cost item. We identified that salaries are impacted by the profitability of operations, which are in turn impacted by revenues (driven by production and market price) and by the total

[1] https://sustainable-agri-trade.eu/dairy-production-standards-and-competitiveness-in-global-markets/

cost of production (including considerations on the total number of cows, employment and labor costs). Considerations were made on the market price, being impacts both by demand and supply. At this stage two feedback loops were identified, one a key determinant of growth (R) related to production resulting in higher profitability and in the expansion of operations, and one being of a balancing nature (B), tending towards equilibrium in relation to the level of salaries provided.

After these initial considerations, the attention moved towards the key drivers of productivity, also a factor affecting the total cost of production. In this context we identified feed quality, genetic improvements, mechanization and robotization as options to increase productivity and reduce the levelized cost of production. On the other hand, national legislation, e.g. on animal welfare, safety and security, while increasing productivity, may also result in higher costs.

As a subsequent step in the creation of the diagram, environmental considerations were added. It was discussed that a higher number of cows would result in increased manure creation, resulting in a higher concentration of nutrients per hectare (e.g. nitrogen and phosphorous). This is a potential limiting factor for the expansion of the animal stock, and is represented by a balancing loop (B) in the diagram. On the other hand, if it is possible to expand the land area available for cows, then this constraint is removed, and reinforcing mechanism is introduced (R). This highlights that land availability, depending on specific local contexts, can be an enabling factor but also a constraint to the expansion of the operations in the dairy sector. On the other hand, environmental constraints do remain, especially when considering GHG emissions. When land is available for expansion, and this is realized via deforestation, carbon sequestration would be lost, increasing the GHG footprint of dairy production. When considering that cows also generate emissions, e.g. via enteric fermentation, GHG intensity may increase.

Several intervention options were identified to remove bottlenecks while increasing the sustainability of dairy production. On the environmental side, reforestation, land restoration and the introduction of renewable energy for farm operations were considered to reduce GHG emissions. Efforts to improve labor and animal conditions were considered to increase revenues (e.g. via subsidies) while at the same time increase productivity. Finally, considerations were made on trade dynamics, with the price of milk import affecting the potential for local production, reason why both improved productivity and environmental sustainability are essential.

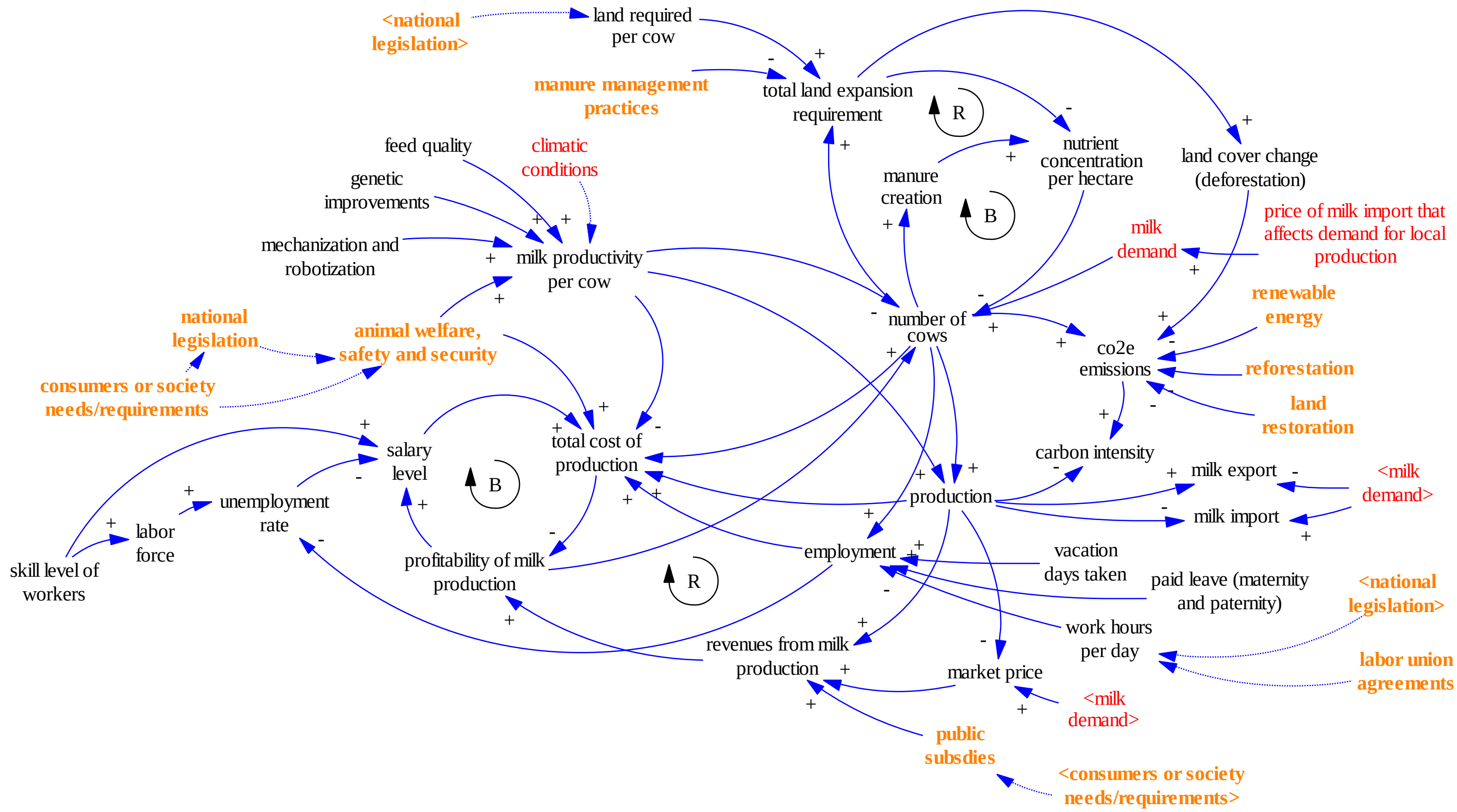

Figure 1. CLD for the dynamics influencing dairy production.

Legend: Red variables (external factors), Orange variables (policy options).

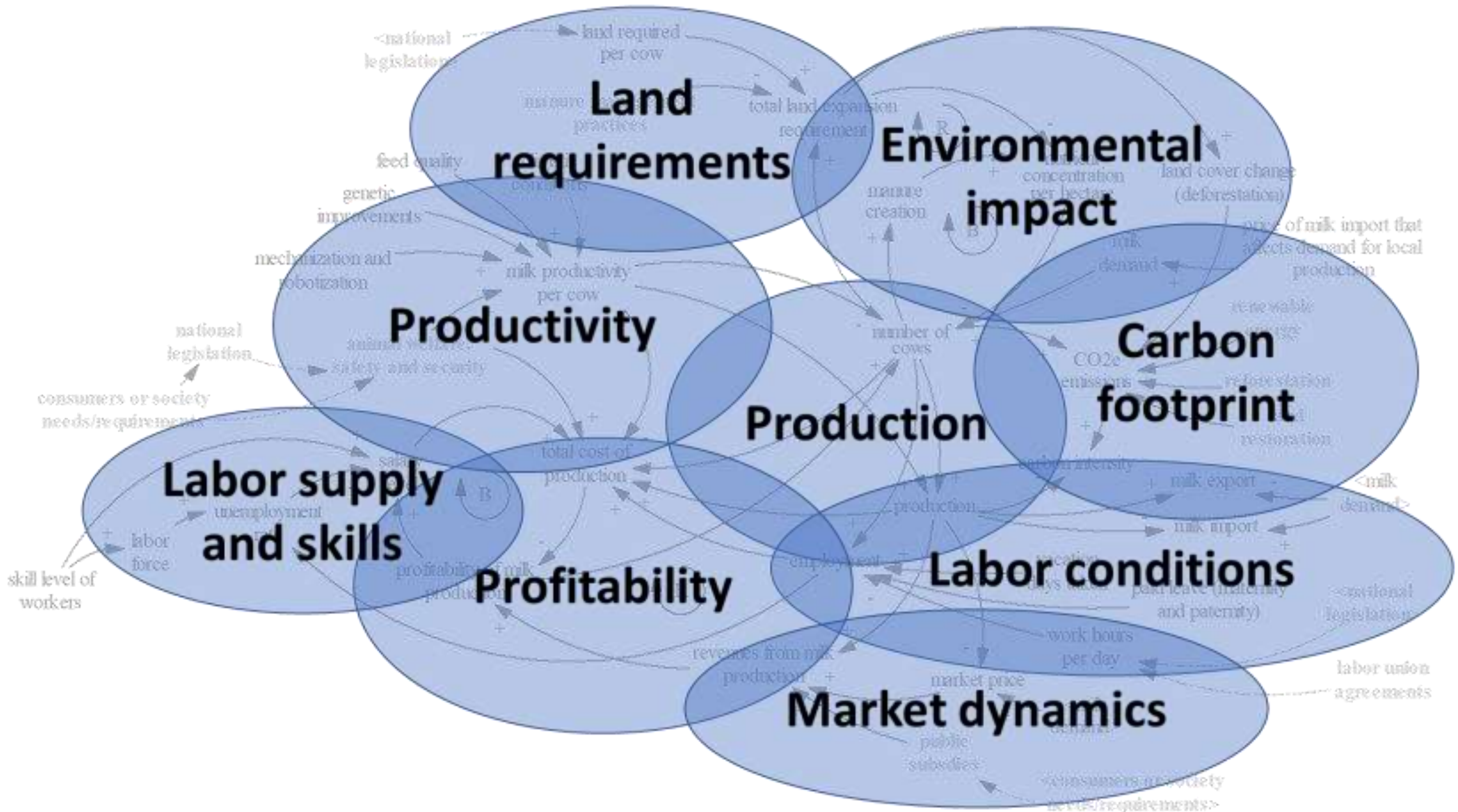

Figure 2. CLD and key thematic areas for dairy production

Text box 1: Introduction to Systems Thinking

Systems Thinking (ST) is an approach that allows us to better understand and forecast the outcomes of our decisions, across sectors, economic actors, over time and in space (Probst & Bassi, 2014). It emphasizes the system, being made of several interconnected parts, rather than focusing on its individual parts.

With ST being an approach, there are several methodologies and tools that support its implementation and hence the identification of the underlying functioning mechanisms of a system and their quantification and evolution over time. In general terms, it can be said that the identification of the components of a system and of the relationships existing among these components (e.g. carried out through the use of Causal Loop Diagrams) represents (i) the *soft* side of Systems Theory. Instead, attempts to quantify these linkages and forecast how their strength might change over time (e.g. carried out using System Dynamics models) represent (ii) the *hard* side of the field.

Concerning the former (i), Causal Loop Diagrams (CLD) allow to create a shared understanding of how the system works, and hence identify effective entry points for (human) intervention, such as public policies. When this is done using a participatory approach, it helps to bring people together, creating the required building blocks for the co-creation of a shared and effective theory of change.

On the latter (ii), System Dynamic models allow to quantify policy outcomes across social, economic and environmental indicators (UNEP, 2014) providing insights on the relative strength of various drivers of change (scenario analysis) and supporting the identification and prioritization of policy intervention (policy analysis). These models can be bottom up or top down (Probst & Bassi, 2014).

In the context of this research, the role of ST is to assess the extent to which the main drivers of change considered (i.e. ageing of population, technological change and fiscal sustainability) can shape future trends, affect existing policy effectiveness and require future interventions. This in turn allows to identify a system's safe operating space and limits, anticipating the emergence of side effects, across social, economic and environmental indicators.

Text box 2: Causal Loop Diagrams (CLD)

A causal loop diagram (CLD) is a map of the system analysed, or, better, a way to explore and represent the interconnections between the key indicators in the analysed sector or system (Probst & Bassi, 2014). As indicated by John Sterman, "*A causal diagram consists of variables connected by arrows denoting the causal influences among the variables. The important feedback loops are also identified in the diagram. Variables are related by causal links, shown by arrows. Link polarities describe the structure of the system. They do not describe the behavior of the variables. That is, they describe what would happen if there were a change. They do not describe what actually happens. Rather, it tells you what would happen if the variable were to change.*" (Sterman, 2000)

As indicated by Sterman, CLDs include variables and arrows (called causal links), with the latter linking the variables together with a sign (either + or −) on each link, indicating a positive or negative causal relation (see Table 1). A causal link from variable A to variable B is positive if a change in A produces a change in B in the same direction. A causal link from variable A to variable B is negative if a change in A produces a change in B in the opposite direction. Circular causal relations between variables form causal, or feedback, loops. There are two types of feedback loops: reinforcing and balancing. The former can be found when an intervention in the system triggers other changes that amplify the effect of that intervention, thus reinforcing it (Forrester, 2002). The latter, balancing loops, tend towards a goal or equilibrium, balancing the forces in the system (Forrester, 2002).

By highlighting the drivers and impacts of the issue to be addressed and by mapping the causal relationships between the key indicators, CLDs support the identification of policy outcomes using a systemic approach (Probst & Bassi, 2014). CLDs can be in fact be used to create storylines corresponding to the implementation of policy interventions, by highlighting direct, indirect and induced policy outcomes across social, economic and environmental indicators.

Variable A	Variable B	Sign
↑	↑	+
↓	↓	+
↑	↓	-
↓	↑	-

Table 1. Causal relations and polarity

References

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