



TRransition paths to **sU**stainable legume-based systems in **E**urope

Using legumes as a source of fertility in organic protected cropping systems

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Background

The use of legumes is at the heart of all organic agricultural systems since their symbiotic association with rhizobia bacteria is the source of most of the nitrogen required for plant and animal production. In arable and field vegetable systems this is most often accomplished by using rotations that include a fertility building phase followed by a period of cropping to utilise the nutrients that have been accumulated. This approach is more difficult in protected cropping situations because the financial value of the infrastructure (glasshouses and polytunnels) makes it harder to justify dedicating adequate time in the rotation for fertility building. Many intensive organic growers consequently rely on the import of fertility in the form of animal manures or by-products such as blood and horn meal. This has ethical implications, especially for vegan consumers, and makes the system reliant on external inputs. **In this case study we will investigate a range of innovative ways of using legumes to build soil fertility.**

Topics to be investigated

1) We will evaluate the potential of several fast growing species of green manures that can be sown directly in the soil in a polytunnel, considering aspects such as their establishment, speed of growth, biomass accumulation, water utilisation, nitrogen fixation and nutrient dynamics in the soil after incorporation (Figures 1 to 4). These could include more unusual legume crops not normally grown as green manures, at least in a temperate climate.

2) This approach obviously still utilises valuable protected cropping space and so, in parallel, work will be done to determine the effectiveness of bringing in legume green manures grown in an adjacent outdoor area. This could be in the form of freshly cut foliage that could be used as a mulch around growing plants, as composted material or as anaerobic digestate. This last option has a number of advantages; methane gas would be produced that could be used for heating and the liquid digestate could be supplied using fertigation methodology, precisely dosing the applications to the crop demand. However, there are a number of practical obstacles to producing it on a small scale that will need to be considered (Figure 5).

3) We will also look at the use of legume meal as a source of nutrients. This relatively high value material would be most suitable for incorporation into growing media, for example those used in the production of vegetable transplants prior to these being planted out in the field (Figure 6).



Figure 1. Yellow trefoil



Figure 2. Persian clover



Figure 3. Crimson clover



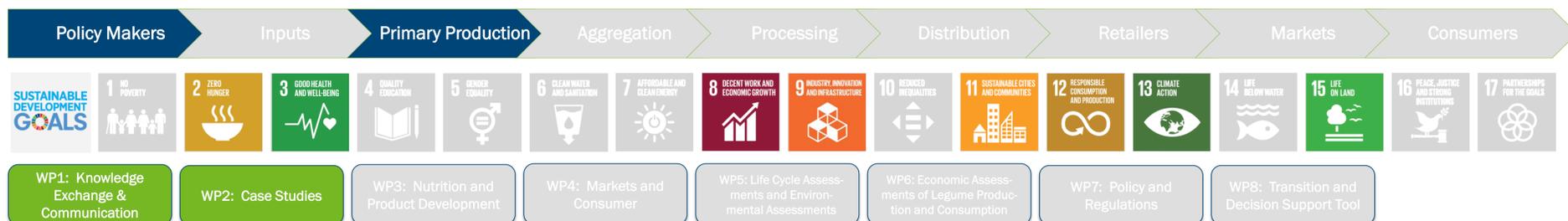
Figure 4. Fenugreek



Figure 5. A small scale biodigester



Figure 6. Brassica transplants



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