

Legume companion cropping for increasing forage productivity in low input system

Editorial

Intercropping is a cropping practice which includes simultaneously growing of two or more species at the same field during a growing season. The main principle of this practice is more efficiently use of natural resources – water, light and nutrients of intercrop components than sole crops resulting in a higher yield and yield quality, particularly in legume-based intercropping systems. By combining and introducing different species and cultivars into the crop rotation intercropping also serves for biodiversity improvement. Intercropping for food production is more common for tropic areas, while in temperate region this practice is more present for forage production.

If it is carefully designed and applied, companion cropping can have many advantages, such as enhanced weed control, reduced soil erosion on sites susceptible to wind or water erosion and improved soil fertility by growing legumes due to their symbiosis with nitrogen-fixating bacteria which have importance for both conventional and low input systems. In many European countries farmers traditionally grows annual legumes with cereals, which ensures them high yield of forage, nutritious forage, but also a very palatable one. Numerous researches have shown that this principle of where cereals provide stability for annual legumes is successfully applied in growing perennial and annual legumes as companion crops. Perennial legume here serves as supported crop and on the other hand annual legume helps for better establishment of perennial legumes.

In general, in temperate region perennial legumes can be sown in late summer/early autumn or in the spring. These legumes are sown shallowly and are exposed to drought which significantly affects seed or young plants, causing slow development or even termination. Spring-sown crops often have a lower yield in the establishment year mostly as a result of weeds which are a greater problem in the spring. As it is mentioned, legumes were often sown with cereals, primarily oat (*Avena sativa* L.) and barley (*Hordeum vulgare* L.), which ensures better establishment but also a higher “pressure” on legumes by its dense habitus. Those species compete with the under sown crop, reducing yield and in some cases the persistence of the stand. Relatively newly method for over passing these issues is establishing perennial legumes with annual legumes. When short term annual forage crop, such as field pea (*Pisum sativum* L.) and vetches (*Vicia spp.*), is sown as companion crop with perennial legume it can provide increased forage protein-rich yield and can reduce weed invasion. Including peas in this mixture may improve forage digestibility too, that is, to increase the forage crude protein content and to decrease neutral and acid detergent fibre. However, high forage and dry matter yield, quality established crop, improvement of soil characteristics results only if we apply some main principles: proper sowing time, sowing adequate species and cultivars and define current cutting time. Goal is to reduce costs as much as it possible but to ensure good stand without any additional requirements like fertilizers or pesticides. Several studies in West Balkan Countries with alfalfa (*Medicago sativa* L.), red clover (*Trifolium pratense* L.) and sainfoin (*Onobrychis viciifolia* Scop.) (Figure 1) with two morphologically different field pea cultivars have shown that the semi-leafless field pea cultivars

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with short stems may be more adapted for intercropping compared to normal leaf type since the light penetration is much higher and provides better conditions for initial growth of the perennial legume.



Figure 1 Field pea as a cover crop in establishing sainfoin (*Onobrychis viciifolia* Scop.).

Field pea and vetches are suitable for intercropping with perennial forage legumes because of its short growing period and because they are harvested when it is the first cut of perennial legume, which is in accordance with many research results which emphasized that companion crop does not have to compete too long with the under sown crop or supporting crop in order to avoid damage and slower growth to the latter. In addition, canopy of those crops is not dense enough to cause suppressive shading and poor establishing and development of the perennial legume.

Another important issue is yield stability in subsequent cuts of the perennial crop. In legume-cereal intercropping systems forage yield of the first cut is much higher than in two legume intercrops. However, due to cereals dense aboveground canopy perennial legumes requires

more time to recover after the first cut and to continue with growth. Annual legumes, in opposite, do not have that suppress impact on under sown crop, particularly in central rows.

Companion cropping principles are also significantly suitable for growing two annual legumes, mostly as cover crops, which are particularly important in organic farming or systems with reduced fertilizers application. In temperate region there are few different species combinations for forage production and they are usually sown in autumn, such as: two morphologically different pea cultivars, legumes with erect stems – faba bean (*Vicia faba L.*) and white lupin (*Lupinus albus L.*) are sown with field pea, vetches, chickpea (*Cicer arietinum L.*) etc. Apart from this there are two additional forms which include legume intercropping such as annual legume forages drilled into an existing stand to boost short-term yields and perennial legumes sown in between the rows of an arable crop.

In conclusion, it is urgent to change cropping systems in order to achieve the environmental requirements of a more durable development. However, the evolution of cropping systems requires the involvement of all the stakeholders and actors influencing agricultural practices. Thus the design new cropping systems requires the involvement of a diversity of actors and the implementation of participatory methods.

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Conflict of interest

The author declares no conflict of interest.