**Crop diversification in the future cropping systems**

*Marjo Keskitalo & Taina Mäkinen*

*MTT Agrifood Research Finland, Plant Production Research, 31600 Jokioinen. Email*

[*marjo.keskitalo@mtt.fi*](mailto:marjo.keskitalo@mtt.fi)

**Introduction**

One of the reasons for the loss of biodiversity in agriculture may be specialization

in crop production overall, which has decreased the number of crops and

especially the area of grasses cultivated in the farms. The major force for

specialization has been the need to improve profitability of the farming economy.

In conventional thinking, maintaining field biodiversity will always decrease total

yield and therefore diversity aspects have been less attractive among farmers.

However, we wanted to raise the issue on the possibility of consolidation of the

improvement of both biodiversity and economy with a same cropping system.

Several experiments have been carried out at MTT during the past few years

aiming to produce information to the key question, can we improve biodiversity of

the fields and the profitability of crop production by special crops, which are

rotated with cereals.

**Material and Methods**

The effect of selected annual (quinoa *Chenopodium quinoa* Willd; false flax

*Camelina sativa* L. Crantz; buckwheat *Fagopyrum esculentum* Moench; and

linseed *Linum usitatissimum* L.) and perennial (caraway *Carum carvi* L.; dyer’s

woad *Isatis tinctoria* L.; nettle *Urtica dioica* L.; and reed canary grass *Phalaris*

*arundinacea* L) special crops on the diversity of insect pollinators and weeds were

studied on the year 2006. Before that, each of the crops were cultivated two

years (2004-2005) at the same site. As a comparison, two conventional crops

(barley *Hordeum vulgare* L.; timothy *Phleum pratense* L.) were cultivated.

Cultivation methods differed among the selected crop species. The amount of

nitrogen fertilization and herbicide treatments applied followed the current

recommendation of each crop.

The weeds were counted twice on the area of 0,25 m2. The first observation was

carried out on the end of June – at the beginning of July (28.6 – 10.7) and the

second at the end of June – beginning of August (26.7 – 7.8) depending on the

sowing and ripening time of each crop.

The pollinators were observed daily or twice a week depending of the flowering

period of the crops. The observations were made during the morning hours and

always at the same time (10 – 11 o’clock). A pre-marked area of 0,25 m2 was

observed for three minutes and flying pollinators which stopped to the flowers,

were recorded.

**Results**

Totally 41 different weed species were identified from 17 different families. About

32 of the weed species were monocots and 9 species were dicots. The mean

number of weed species identified among the annual crop species were 18 and

among the biennial or perennial crop species 18,75. Statistical differences on the

66

number of weed species among the crops were observed. The number of weed

species among barley on the second observation were statistically smaller

(p<0,0001) comparing to the number of weeds among *Chenopodium quinoa,*

*Camelina sativa* and *Fagopyrum esculentum*. Also, the number of weed species

among timothy were statistically (p<0,005 – 0,0001) smaller comparing to *Isatis*

*tinctoria, Urtica dioica* and *Phalaris arundinacea*. The dry weight of weeds differed

statistically from each other. The dry weight of weeds from barley and timothy

plots, were always statistically (p<0,009 – 0,0001) lower than the studied annual

and biennial-perennial crops, respectively.

*Fagopyrum esculentum, Urtica dioica, Isatis tinctoria* and *Carum carvi* were the

most attractive special crops for pollinators. The most common pollinators were

flower flies (*Syrphidae) and honeybees (Apoidea).* Others such as butterflies

*(Lepidoptera*), bumblebees (*Bombus*) and wasps (*Vespidae*) were observed only

occasionally.

**Conclusions**

According to the results, the selected special crops may attract pollinators such as

honeybees and flower flies more than conventionally cultivated crops. Also, the

number of weed species among special crops may be higher than the number of

weeds identified among barley and timothy. The high amount of dry weight and

weed species among the special crops may be due to the challenges of herbicide

treatments. These results may be used when strategies for more diversified

cropping systems, where selected special crops could be cultivated as a rotation

with conventionally corps, are planned.

**References**

Mäkinen, T. 2009. The effect of special plant cultivation in farmland biodiversity -

if measured by the amount of weeds and pollinating insects. Master's thesis,

Faculty of Agriculture and Forestry, Department of Applied Biology, 69 p.

67