times varying between early- and late-season over time to avoid proliferation of particular species. Perennial cover crops, on the other hand, may actually enhance the persistence of seeds in the seedbank. The past decade has seen considerable interest in manipulating seedbanks, with considerable interest in predation, and advances related to the importance seeds availability and predator demand.

Lastly, as evidence that progress is possible, there are the few known examples of organic farmers who have seemingly 'solved' their weed problems. They share a focus on preventing seed production, reflecting the wisdom of the age-old adage ('a years seeding...'), and the more recently proposed 'No Seed Threshold' (Norris, 1999). They have experienced progress in their weed management efforts, as their seedbanks decline over time. At first consideration, their tactics - intensive use of organic mulches and summer fallowing - may seem extreme, beyond practical. They argue, however, that practices which simultaneously control weeds, improve soil quality, and permit available labor to manage other aspects of the farm are critical to sustaining their enterprises. These farmers exemplify the goal stated in the 2007 National Organic Research Agenda, published by the U.S.-based Organic Research Agenda, to understand and develop management systems that shift the focus of pest management from use of external inputs to internal biological controls arising from the system itself, leading to whole farm systemic resistance to weeds...

613. New Technologies Call for New Research Priorities in Physical Weed Control with Low Selectivity. Jesper Rasmussen1, Michael Norremark2, Bo Martin Bibby2; 1The University of Copenhagen, Taastrup, Denmark; 2The University of Aarhus, Horsens, Denmark

A web-based digital image analysis tool (IMAGING Crop Response Analyst) has been developed, tested and made public (www.imaging-crops.dk). This new technology makes possible objective estimations of crop-soil cover (i.e. how much crop is buried with soil) associated with post-emergence weed control with spring time harrows, rotary hoes and other weeder. Objective estimation of crop-soil cover offers new possibilities to improve decision support of physical weed control practises with low selectivity because trade-offs between weed control and resulting injury to the associated crop may now be quantified, communicated and incorporated into models. The objective of this presentation is to suggest key parameters and research priorities for future research and to suggest standards for estimation and statistical test of the analytical parameters. The overall aim is to help researchers deliver reliable parameter estimates that may help to predict the optimal intensity and timing of physical weed control with low selectivity and, thereby, contribute to the theoretical and methodological framework of physical weed control. Selectivity and crop recovery are suggested as key parameters because they are crucial in predictive models and are less influenced by site-specific soil conditions and implement settings than other parameters. Selectivity is defined as the ratio between weed control and crop-soil cover and crop recovery is defined as the ability of the crop to recover from soil coverage. Both parameters depend on the intensity of tillage. To facilitate comparisons between different studies, it is suggested that the crop soil cover associated with 80% weed control and the relative crop yield loss associated with 25% crop-soil cover are calculated with 95%-confidence intervals. Experimental protocols needed to make such calculations are outlined and factors that influence - or may influence - selectivity and recovery are listed and research priorities are given. Crop tolerance has previously been used to express the susceptibility of the crop to physical weed control, but crop recovery is shown to be more useful in decision support models than crop tolerance. Recent studies using the new digital image analysis tool and the above suggested parameter estimation procedure show that timing of weed harrowing is of lesser importance if the intensity of tillage is correctly adjusted to the growth stage compared with prediction of the optimal intensity in site-specific conditions. This latter issue remains the major challenge for future development.

614. Effects of Sowing Measures on Weeds and Yield of Organically Grown Wheat. Arnd Verschwele1; 1Julius Kühn Institute, Braunschweig, Niedersachsen, Germany

Weed control by harrowing is an essential measure in organically grown cereals, but it is also known to be less effective against perennial weeds. Such problems might be solved by using a more effective hoeing which needs wider row spaces. On the other hand, there is a risk of low competitiveness in wide crop stands, particularly if mechanical control effects are unsatisfying.

Therefore, a new approach has been investigated by using a crop design with alternating crop bands and crop-free bands. Using hoes in the crop-free band as well as a higher crop competitiveness within the crop band are two possible effects in order to make weed control more effective.

Three winter wheat experiments were conducted in 2005, 2006 and 2007 (year of harvest) at the organic farming research area. The trials were performed in a block design with 4 replications and a plot size of 120 m² including the following row spacings:

(a) narrow spacing: row distance of 100 mm,
(b) band spacing: bands of 4 rows (400 mm width) alternate with crop-free bands (300 mm width),
(c) wide spacing: row distance of 400 mm.

As a second factor we tested two winter wheat cultivars with different crop competitiveness (L. Ludwig, 2. Pegassos). Pegassos is known as a cultivar fairly adapted to the conditions of organic farming. It is characterised by
prostrated and large leaves whereas Ludwig can be described by a more upright growth and consequently a low weed suppressing ability.

Because of a very high initial weed infestation it was not possible to keep plots weed free. Depending on the weed density all plots have been harrowed 2-3 times, additionally the plots with the crop bands and wide rows (variant b and c) have been hoed two times. Among others, the following parameters have been assessed: weed coverage, weed biomass, weed number, crop yield and crop quality. Data were analysed by a multifactor analysis process using Statgraphics Plus, version 5.1. Based on all data, mean values and confidence levels were calculated by considering the 3 tested factors row spacing, cultivar and year.

The initial weed density varied from 225 to 451 weeds m\(^2\). The most frequent weed species were Lamium spp., Veronica spp. Stellaria media and Urtica urens. The weed density assessed before mechanical control measures was not affected by row spacing (P=0.737) and year (P=0.069) but by cultivar (P=0.006). There were no significant interactions between these factors. However, compared to the number of weeds there were stronger effects on the weed biomass. Row distance and year did effect the weed dry matter assessed at growth stage BBCH 61-65 significantly (P=0.016 and 0.000). The following weed biomass was estimated at the 3 row spacings: (a) 21.9, (b) 2.61, (c) 45.9 g/m\(^2\). Differences between (a) and (b) were not significant, but the wide spacing (c) resulted in significant higher weed infestation. In 2005 and 2006 there was also a cultivar effect on weed infestation: Corresponding to a higher crop cover, Pegassos showed a stronger weed suppression rather than Ludwig, especially in the wide spaced crop stand. No differences between both cultivars have been observed in 2007 and at the band spacing.

All factors (row spacing, cultivar, year) had a significant effect on the grain yield of winter wheat (P<0.001). The highest grain yield averaged over the 3 years (6.24 t/ha) was measured at band spacing (b) compared 5.85 t/ha at narrow spacing (a) and 5.28 t/ha at wide spacing (c). This indicates the high compensating ability of the both wheat cultivars. The results show that, at least under favourable soil and weather conditions, good weed control efficacy can be combined with high grain yield by using a band sown crop stand.

615. Organic Vegetable Cropping Systems for Purple Nutsedge Management. Carlene Chase\(^1\), Rosalie Koenig\(^1\), Jeffery Pack\(^2\); \(^1\)University of Florida, Gainesville, Florida, United States of America; \(^2\)Escuela Agrícola Panamericana, Tegucigalpa, Honduras

Infestations of perennial weeds are significant obstacles to organic production and can result in growers removing infested acreage from production. Uncontrolled populations of purple nutsedge (Cyperus rotundus) can cause complete crop failure. An on-farm evaluation of serial integrated crop management systems was conducted to manage purple nutsedge in organic vegetables in north-central Florida. A multi-pronged approach that involves yearlong management during fallow and cropping periods was employed. Summer fallow techniques included sunn hemp (Crotalaria juncea) as a cover crop, soil solarization, clean fallow with weekly tillage, clean fallow with flaming, and were compared with a weedy fallow. Two sunn hemp treatments were used so that after 12 weeks of growth stems were cut just above the soil surface and either incorporated prior to transplanting the fall crops or retained on the soil surface as mulch. The persistence of purple nutsedge suppression was evaluated in two subsequent fall cash crops (lettuce, Lactuca sativa and broccoli, Brassica oleracea) and spring cash crops (zucchini squash, Cucurbita pepo and bell pepper, Capsicum annum) with differing canopy sizes and rates of growth and development. The additional benefit that could be obtained from a weed-suppressive infrared-transmitting (IRT) mulch was also assessed. All summer fallow treatments effectively suppressed purple nutsedge and the suppression persisted within subsequent fall and spring vegetable crops. Highest lettuce yields occurred with incorporated sunn hemp, solarization and tillage; and broccoli yields were best with flaming, solarization, and tillage. Pepper yields were higher with tillage than with all other fallow treatments. Squash was very competitive with purple nutsedge so that yields with the weedy fallow on bare ground did not differ from those of most of the other fallow treatments. The use of IRT film further reduced purple nutsedge infestation and increased squash and pepper yields. The most consistent and effective combination of treatments appears to be weekly tillage in summer followed by IRT film in spring.

616. Pre-Plant Composting of Organic Matter Helps Weed Control in Organically Grown Vegetables. Barakat Abu Irmaileh\(^1\), Azmi Abu Rayyan\(^1\); \(^1\)Faculty of Agriculture-University of Jordan, Amman, Jordan

Weed management in vegetables is a must; otherwise severe yield reductions are anticipated. Several methods are normally applied for weed control including herbicides. However, chemical weed control is not a choice in organically grown vegetables. Several experiments were carried out to investigate the efficiency of pre-plant composting of several organic matters in reducing weed populations under natural weed infestations in various vegetables. Composting was carried out by incorporating organic matter in 0.4m-band in the soil of the planting rows. After incorporation, the rows were immediately covered by black polyethylene (BPE) sheets then drip-irrigated twice during a period of six weeks before planting. In a split-plot experiment, the tested organic matters were wheat hay, manures of cow, poultry or sheep,