ICROFS news

1/2014

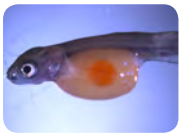
June

Newsletter from the International Centre for Research in Organic Food Systems

Contents

News from ICROFS

Articles



Brief news, page 16:

Read about new publications, conferences and projects....

ICROFS
International Centre for Research in Organic Food Systems

10 new Organic RDD 2 projects have been launched

Your input to *ICROFSnews*

We listen to our readers' response with pleasure, as we are here for you!
Therefore, any response are more than welcome, be it about the format, suggestions to improvements, changes, content or anything you can think of.

Contact us at: LindaS.Sorensen@icrofs.org

10 new Organic RDD 2 projects have been launched

The Organic Research, Development and Demonstration Programme 2 (Organic RDD 2) is the Danish national research programme regarding organic food systems. It runs in the period 2014-2018 and has a total budget of 90 m. DKK.

It is coordinated by ICROFS, International Centre for Research in Organic Food Systems and is funded by the Green Growth and Development programme (GUDP) under the Danish Ministry of Food, Agriculture and Fisheries.

The themes of the programme are based on the recommendations formulated in ICROFS' Research and Development Strategy 2012, which was developed in close co-operation with a wide range of stakeholders within or associated with the organic sector. The ten projects in the Organic RDD 2 programme are:

VIPiglets - Low mortality through birth of vital piglets

PROTECFRUIT: Protected production of organic apples and pears

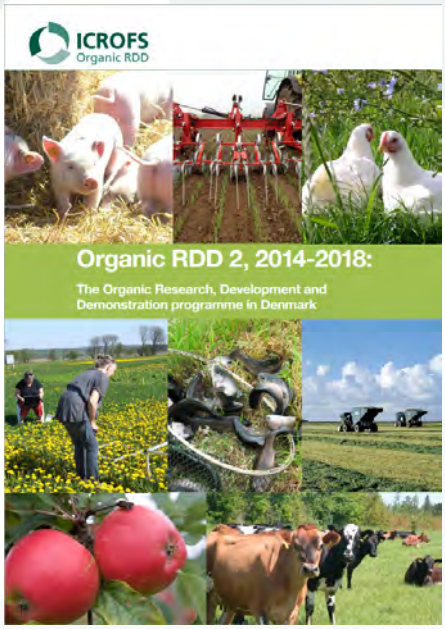
MultiChick - Diversity and integrity in organic poultry meat production

pECOSYSTEM - Pig production in eco-efficient organic systems

RobustFish - New possibilities for growth and robustness in organic aquaculture

SOBCows - Specialised organic breeding goals and breeding schemes for dairy cattle

MultiPlant: Multifunctional perennial high-value crops in organic plant production



BEEFARM - Wild bees and pollination on organic farms

OrganoFinery - Biorefined organic protein feed, fertilizer and energy

RowCrop - Row cropping in organic arable farming for increased productivity and sustainability

You canfind an overview of the Organic RDD 2 projects on our website here

or download the Organic RDD 2 leaflet.

New employee in ICROFS

ICROFS' communication manager Camilla Mathiesen is from the 30rd of June until next summer on maternity leave. Nina Hermansen will be her replacement during that time. Nina comes from a job as communication partner at School of Business and Social Sciences, Aarhus University and she will start in ICROFS 15th of June. We warmly welcome Nina in the ICROFS staff.

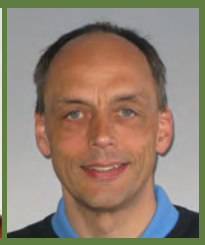
A white paper on regenerative organic agriculture and climate change

The Rodale Institute has issued a white paper on Regenerative Organic Agriculture and Climate Change.

The Rodale Institute has announced the launch of a global campaign to generate public awareness of soil's ability to reverse climate change. The campaign will call for the restructuring of the global food system with the goal of reversing climate change through photosynthesis and biology.

The white paper, entitled Regenerative Organic Agriculture and Climate Change: A Down-to-Earth Solution to Global Warming, is the central tool of the campaign. Read more at: http://www.icrofs.org/pdf/2014_RegenOrgAgricultureAndClimateChange_20140418.pdf

Eating quality of meat from organic beef based on crossbred animals



By Margrethe Therkildsen, Department of Food Science, Aarhus University, Denmark and Mogens Vestergaard, Department of Animal Science, Aarhus University, Denmark

Production of organic beef from young cattle is not very developed in Denmark, in spite of a well-established organic dairy production that could deliver bull calves for use in organic beef production. Instead these calves are sold to conventional beef producers, because of low performance in organic production systems.

The purpose of this study was to test a concept for production of organic beef based on crossbred animals from dairy cows sired with a beef breed. The results show that crossbred Limousine X Holstein bulls and heifers may be an alternative to purebred Holstein bulls in organic beef production of young cattle because of improved gain and carcass conformation, aroma and taste. However, the fatness and texture of the crossbred bulls need to be improved through changes in the production strategy, especially feeding prior to slaughter, and in the pre and post mortem handling.

Production of organic beef from young cattle is not very developed in Denmark even though there is a well-established organic dairy production which per se produces male off-spring that could be utilized for organic beef production. Production of organic beef requires among other things that the animals are raised outdoor during 6 months of the year and with large quantities (60% or more) of roughage in the diet. These rules are two of the major constraints for the development of the organic beef from young cattle as the pure-bred dairy breeds do not perform very well on diets rich in pasture and roughage and specifically classify rather poor on the EUROP conformation scale. The consequence is that the male off-spring from organic dairy production is sold for conventional beef production. Introduction of beef breed semen in the dairy herd could contribute with a better growth rate and higher carcass weight, i.e., higher muscularity of the crossbred animals, which in terms would improve overall production efficiency. Furthermore, keeping the bulls as entire males is a way to utilize the full growth potential and also to address the welfare advantage obtained without castration As grazing is the sole feed during summer periods, it is critical that pasture and sward are of high quality to assure a high growth rate of the animals. The purpose of the present study was to test a prototype concept for production of organic beef from young

cattle (entire males and heifers), based on crossbred animals from dairy cows sired with a beef breed, feeding a low energy diet during winter and giving access to high yielding clover-grass swards for summer grazing.

Animals in the study

The study included spring-born crossbred Limousine x Holstein bulls (CB) and heifers (CH), 15 of each, which were compared with 15 Holstein bulls (HB). The calves were purchased 20 days of age and slaughtered at the age of 16.9 month. The calves were kept indoors in groups of 5 animals of the same treatment group until weaning from milk replacer at 3 month. Average daily gain from birth to weaning was 724 g/d and not different between treatment groups.

Calves were gradually introduced to a grass-silage based ration from 3 to 4 month, and were then raised on a mixed ryegrass-white clover pasture from 4 to 7 month (1st summer). From late October till mid-May, animals were kept in the same groups of 5 animals and were housed in deep litter stalls with free access to a low energy grass-haylage ration. The 2nd summer, the animals were grazing in a rotational paddock system (18 paddocks) in the same groups of 5 animals (9 groups) and generally moved to a new sward every week.

Animals were slaughtered directly from pasture in mid-August or early September at a commercial slaughter plant (Danish Crown, Aalborg). The carcasses were weighed and classified according to the EUROP scale for conformation and fatness. Twenty-four hours post mortem the pH was measured in filet (M. longissimus dorsi) and Round (M. semimembranosus) in 8 animals of each treatment group and the two muscles were sampled for additional ageing for 13 days at 4◎C. Following ageing the muscles were stored at -20◎C until sensory evaluation of the meat 3 months later.

Eating quality was evaluated

The eating quality was

Table 1 Carcass quality characteristics of grazing Holstein bulls (HB) and Limousine x Holstein bulls (CB) and heifers (CH)

	HB	CB	CH	SEM
Carcass weight, kg	272[b]	315[a]	249[c]	4.5
EUROP conformation	3.0[c]	7.0[a]	5.3[b]	0.15
EUROP fatness	1.0[b]	1.2[b]	2.9[a]	0.07
pH_{24} LD	5.88	5.61	5.55	0.10
pH_{24} SM	5.62	5.56	5.59	0.03

[abc]Means within a row without common superscript letters are different at P < 0.05.

Table 2 Eating quality of round (SM) from grazing Holstein bulls (HB) and Limousine x Holstein bulls (CB) and heifers (CH)

	HB	CB	CH	SEM
Taste				
Meat	5.84	6.05	6.32	0.26
Game	2.91	2.76	2.57	0.26
Sweet	3.38	3.13	3.00	0.17
Liver	1.29	1.62	1.71	0.22
Metal	4.27	4.03	4.28	0.31
Bitter	3.49	2.90	3.01	0.22
Texture				
Tenderness	5.71[b]	5.18[b]	7.67[a]	0.64
Chewing time	9.53[ab]	9.97[a]	8.25[b]	0.52
Juiciness	7.33	6.31	7.05	0.50

[ab]Means within a row without common superscript letters are different at P < 0.05.

Table 3 Eating quality of filet (LD) from grazing Holstein bulls (HB) and Limousine x Holstein bulls (CB) and heifers (CH)

	HB	CB	CH	SEM
Aroma				
Meat	5.81	6.48	6.61	0.29
Metal	2.72	2.51	2.23	0.34
Liver	2.15[a]	1.76[ab]	1.14[b]	0.34
Game	3.45[a]	2.19[b]	1.55[b]	0.17
Taste				
Meat	5.49[b]	6.57[a]	7.00[a]	0.27
Game	3.51[a]	2.05[b]	1.43[b]	0.53
Sweet	3.50	2.83	2.80	0.34
Liver	2.07	1.52	1.33	0.27
Metal	3.52	3.66	3.24	0.42
Bitter	4.18[a]	3.42[b]	2.80[b]	0.28
Texture				
Tenderness	6.17[b]	6.12[b]	9.49[a]	1.84
Chewing time	8.61[a]	8.25[a]	5.54[b]	1.70
Juiciness	8.37	8.09	8.51	0.35

[ab]Means within a row without common superscript letters are different at P < 0.05.

evaluated by a nine-member trained sensory panel on an unstructured scale from 0 to 15, with 0 representing minor aroma and taste characteristics and tough meat and 15 representing intense aroma and taste characteristics as well as tender meat. The filet (LD) was prepared as 20 mm steaks on a frying pan to an internal temperature of 63◎C and the round (SM) was prepared as a roast in an oven (100◎C) to an internal temperature of 63◎C.

Production and carcassr quality

The crossbred bulls responded as expected with a higher daily gain in general, and specifically during the 2nd summer the crossbred bulls showed the potential for a larger gain, even on pasture with an increase of 26% compared with the purebred Holstein bulls. Crossbred heifers gained 22% less than Holstein bulls during 2nd summer. The crossbreeding also improved the EUROP conformation markedly, and the crossbred heifers classified better than purebred bulls (Table 1).

There was no difference in fatness of the two groups of pasture-fed bulls, which were both too low and caused a penalty in the payment, whereas the crossbred heifers had an acceptable fat cover. The pH measured 24h post mortem in the filet and round did not differ between the treatment groups (Table 1).

At the sensory evaluation the panel recognised no variation in the taste of SM (Table 2) whereas the LD from HB had more gamy and bitter and less meaty taste compared with CB and CH (Table 3).

The texture of both cuts was affected by the sex of the animals, thus the tenderness and chewing time was inferior in cuts from HB and CB compared with CH (Table 2 and 3).

Comparisons of texture traits between meat from heifers and bulls often favour the heifers, but not always. In the present study some of the difference may be explained by the difference in fat content based on the difference in fatness score.

The tenderness score of 5.7 and 5.2 for SM and 6.2 and 6.1 for LD from HB and CB, respectively, is expected to be too low to fulfil consumer expectations of tender beef. In other studies a negative effect on meat tenderness has also been seen with animals slaughtered directly from pasture in comparison with animals either offered concentrate at pasture or fed indoor with mainly concentrate before slaughter. This can be related to a positive relationship between daily gain prior to slaughter and tenderness development post mortem but also to a predisposition of the bulls held in a free range system for fighting and stress prior to slaughter, with negative consequences for the final meat quality.

Crossbred animals may be an alternative

In conclusion crossbred Limousine X Holstein bulls and heifers may be an alternative to purebred Holstein bulls in organic beef production of young cattle because of the improved gain and carcass conformation, aroma and taste, but the fatness and texture of the crossbred bulls need to be improved through changes in the production strategy, especially feeding prior to slaughter, and in the pre and post mortem handling.

More information

Read more about the Organic RDD project SUMMER at: http://www.icrofs.dk/Sider/Forskning/organic-crdd_summer.html

Organic RDD is financed by the Ministry of Food, Agriculture and Fisheries and coordinated by ICROFS.

Animating Multicriteria Decision-making Processes in the Organic Value Chain

By Peter Kastberg, Department of Business Communication, Aarhus University

When thinking about animations, an intuitive reaction could be to dismiss them as mere children's pastime, but that is by no means the whole picture. Animated films featuring highly specialized knowledge from, say, the domains of science, technology and engineering are to be found all over the current media landscape. There is a tendency that they are predominantly used in one specific communicative constellation, i.e., when domain-specific knowledge is communicated from an expert or authority to a lay person. That, too, is the case when it comes to the animated film "MultiTrust". This animation stems from the research project "MultiTrust", which was conducted under the auspices of ICROFS. The color animation film was produced in 2013 by the award-wining Danish production company and animation studio Tumblehead Aps.

A primary intention of this multifaceted research project MultiTrust was to "make it easier for consumers […] to observe and evaluate the different contributions that organic food systems offer", with a special emphasis "to promote communication, participation and learning" about organic foods. One tangible result of this endeavor was the animated film aiming at presenting a novel way of communicating about multicriteria buyer decision-making with regards to organic food purchases.

Whereas the film as such does not present a tool ready to be employed in the service of consumer communication, it does present a prototype for how we might design future communications about organic food products in a novel way. A way which – ideally – constructs a meeting place between consumers, producers and sellers as well as allows each stakeholder in the organic value chain to build up ever more nuanced decision-making competences. In the following I will present the prototype from the point of view of the consumer's decision-making process.

Informed decision-making

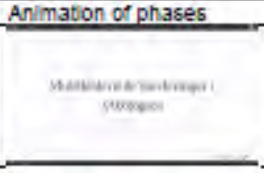
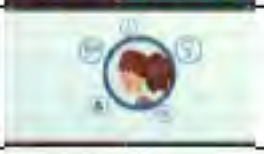
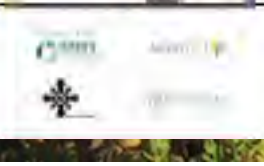
Research into consumers' decision-making when it comes to buying organic food shows that one of the primary reasons why consumers do not buy more organic foods is not lack of information per se, but lack of information allowing for informed decision making. Due to the mundane yet highly consequential fact that, in the industrialized part of the world, producers and consumers no longer know each other, food communication is, quite simply, inescapable. One of the ways in which authorities have sought to inform publics about the added-value of organic foods is via wide-spread labelling initiatives. On a national level examples could be the German "Bio-Siegel" or the "USDA Organic" label in the U.S.; on a supranational level a prominent example is the "EU Ecolabel for Consumers". Whereas labeling is certainly a cost-effective means of organic food communication, the problem is, naturally, that any labeling is rendered futile if the consumer does not understand it. And studies consistently show that consumers do not understand these labels. We are not, then, dealing with a lack of information in general (the information is 'out there'); we are in fact challenged with the task of communicating information about organic foods in such a way as to allow the consumer to create his or her own knowledge based on what s/he perceives, i.e., knowledge of the kind that allows for informed decision making with regards to organic foods.

Three assumptions

The animated "MultiTrust" prototype rests on three assumptions: Firstly that the consumer does not make his or her purchase decision on merely one criterion, but that the purchase decision is indeed inherently a multicriterial one. For the consumer of meat, for instance, one criteria may be that the animal has been feeding on organic fodder but maybe an even more important criteria could be that of animal wellfare, i.e.

Figure 1: Visual rendering of phases at the level of presentation.

"MultiTrust" animation film

Phases	Animation of phases	Description of phases
Phase 1		The film introduces the research project from which the animation stems.
Phase 2		The film begins by depicting a consumer, who is puzzled by the many quality criteria she is faced with when wishing to purchase organic food products.
Phase 3		The film jumps to a farmer, who is, too, overwhelmed by the number and diversity of criteria of organic food production.
Phase 4		The film now introduces the Danish eco label, and explains how the authorities, recognizing this confusion, seek to remedy it by way of placing a national eco label on all organic products.
Phase 5		The problem is, however, that the national Danish eco label cannot help out either since it, too, covers a variety of different criteria – and products.
Phase 6		Returning to the organic farmer, he, too, is puzzled by the eco label, and left to his own device may opt – out of his own accord – to focus on some criteria while neglecting others.
Phase 7		But farmer and consumer are not the only stakeholders directly involved with organic food products; the production plants as well as the point of sale of organic foods are equally involved – and may, in turn, focus on entirely different assessment criteria.
Phase 8		A fact which leaves both farmer and consumer even more confused as to how to assess the quality of organic foods.
Phase 9		The film now changes from describing the problems to hinting at a solution. It does so by posing a question: So, what if there was an ICT platform where the consumer could find all the information she needs?
Phase 10		A platform where the consumer could type in her preferences when it comes to assessment criteria.
Phase 11		The film expands on this idea and poses yet another question: What if the ICT platform was not only a platform for the consumer but a platform for all stakeholders involved (farmers, producers, sellers and consumers alike)?
Phase 12		On such a platform the consumer's criteria could be reciprocated by, say, the farmer's documentation.
Phase 13		In this way the consumer would have access to multiple criteria for organic foods; this would allow her to conduct a multicriteria assessment of the quality of organic food products.
Phase 14		The film ends by listing the sponsors as well as the creators of the animation are listed.

that the animal has been treated better than stipulated by current law etc. Secondly, that each stakeholder in the 'from farm to fork' value chain (in crude generalization: producer, seller, consumer) harbors different criteria for determining what good organic food is. What the consumer sees as good organic practice may to the farmer be a practice too expensive to adhere to, to the seller logistically too demanding etc. And last but certainly not least that the only place where all these stakeholders are in fact able to meet is on the Internet. In order to overcome alienation and possible (mutual) misunderstandings all parties involved would need to resort to a common ground of sorts. And a joint website is the obvious choice for establishing a (virtual) common ground, i.e., not all consumers may know an organic farmer, but all consumers (mutatis mutandis) own a laptop with Internet access. No existing organic communication effort takes its point of departure in these assumptions.

The animated "MultiTrust" film

The animated "MultiTrust" film, consequently, ventures to propose a new approach to communicating about organic foods in which the focus is on how to increase involvement and reduce uncertainty in relation to organic food consumption rather than merely stating facts or communication labels. In order to present how the prototype is a) envisioned and b) integrated into the above organic value chain, we will take a closer and somewhat analytical look at the animation itself.

For presentational purposes the animation has been broken down into its core narrative elements below. The prototype itself is presented in the phases 9 through 12.

A three-phased narrative structure

As may be inferred we are dealing with a three-phased narrative structure in which the starting point is a state of deficiency which, in the course of the narration, is remedied through a procedure of improvement; the result of which is a satisfactory state. Given that the animation is directed at consumers, and given that the driving force of any narrative is conflict, it is no surprise that the animation features a conflict involving and evolving around the character of the consumer. The conflict is depicted in phase 8, in which both the consumer and farmer are portrayed as being at a total loss. The denouement or resolution to the conflict sets in in phase 9 where the consumer is placed in front of a lap top computer where she is searching for an ICT platform to help her out. In the phases 10 to 12 the attributes of the (would be) platform or prototype are sketched out, and in phase 13 the consumer – thanks to the prototype – is now able to conduct a multicriteria assessment of the quality of organic food products prior to purchase.

The animation is an indication that promoting "communication, participation and learning" about organic foods is by no means as straightforward as merely adding stick-on labels to organic foods. If we take seriously that the consumer not only needs to be exposed to, say, the EU Ecolabel but that s/he needs to be allowed to make multi-criteria assessments of his / her own, then we also need to take seriously that gauging the deposit of whatever communicative endeavor we may perform, is critical to our success. For whereas all sorts of content may be relatively easily transmittable, say, at the click of a mouse button, reception, understanding and any ensuing operationalizing based on this understanding is not.

All said, in appreciating that any model of communication is also a model for communication it is maintained that communication seen and performed as participative holds promising qualities with regards to helping the lay person to understand, to assess and to make informed, multicriteria decisions. Taking a step back we may say that the prototype does not only envision a novel way of designing organic communication it does also help emancipate, if you will, the organic consumer. An emancipation that is in tune with the Zeitgeist of late or postmodern societies inclined to favor deliberative and participatory public engagement.

More information

Read more about the Organic RDD project MultiTrust at: http://www.icrofs.dk/Sider/Forskning/organic-crdd_multitrust.html

Organic RDD is financed by the Ministry of Food, Agriculture and Fisheries and coordinated by ICROFS.

Ramsons can deliver taste and antibacterial effect in food preservation: From nature to cultivation



By Martin Jensen[1], Flemming Hansen[2], Kai Grevsen[1]
Department of Food Science, Aarhus University[1], Danish Technological Institute, DMRI [2]

Ramsons (*Allium ursinum*) contain sulphur compounds that display strong antibacterial activity against *Listeria, Salmonella* and *E. coli*. Onion bulbs and flowers have a higher concentration of allicin than leaves and stems and display higher inhibitory activity. Grinded onion bulbs have shown strong antibacterial effects in meat test models and may potentially be used as an alternative to preserve organic meat products. Cultivation methods are investigated.


Ramsons in the forest. Photo: AU Food Science

In the Danish Organic RDD project BerryMeat, a large number of herbs and berries were screened for their ability to inhibit bacterial growth of *Listeria monocytogenes, Salmonella typhimurium* and *E. coli*.

Ramsons showed strong inhibitory activity against all three bacteria. Test of different parts of the plant showed stronger bacteriostatic activity against *Listeria* and stronger bactericidal activity against *Salmonella* by onion bulbs and flowers compared to leaves and stems. This matched a higher concentration of allicin, the main sulphur compound produced in ramsons, in onion bulbs and flowers.

Alliin is easily degraded by the alliinase enzyme to allicin and a number of sulphur contaning derivatives that also exert antibacterial activity. Four different formulations of onion bulbs were tested for their content of allicin and their antibacterial effect after preparation: freeze-dried/grinded, oven-dried/grinded, fresh/grinded and fresh/grinded/pasteurized at 92 °C. When corrected for similar dry-matter content all four formulations showed high antibacterial activity in a "broth inhibition test" both shortly after preparation and after 1 and 1,5 years of storage at -20°C.

The content of allicin expressed as alliin eqv. following an enzymatic full conversion were highest in the freeze dried product, followed by oven-dried product, whereas the fresh/grinded had lower content and the fresh pasteurized product had the least allicin content. When corrected for lower dry-matter in the wet products the concentration was 7 mg/g DM in the fresh/grinded product, but down to 3 mg/g DM in the fresh pasteurized product. Allicin therefore may be lost partly during pasteurization. Addition of 8 % ramson bulb product into a "broth inhibition test" gave higher inhibitory activity than 4 % and thus, showed a dose-response effect.

Hermetic sealed freeze-dried powder, stored at -20, +5, 20 and 40 °C for 4 weeks did not reduce the content of allicin, regardless of temperature indicating that a freeze dried powder stored hermetically seems to be a robust product. A

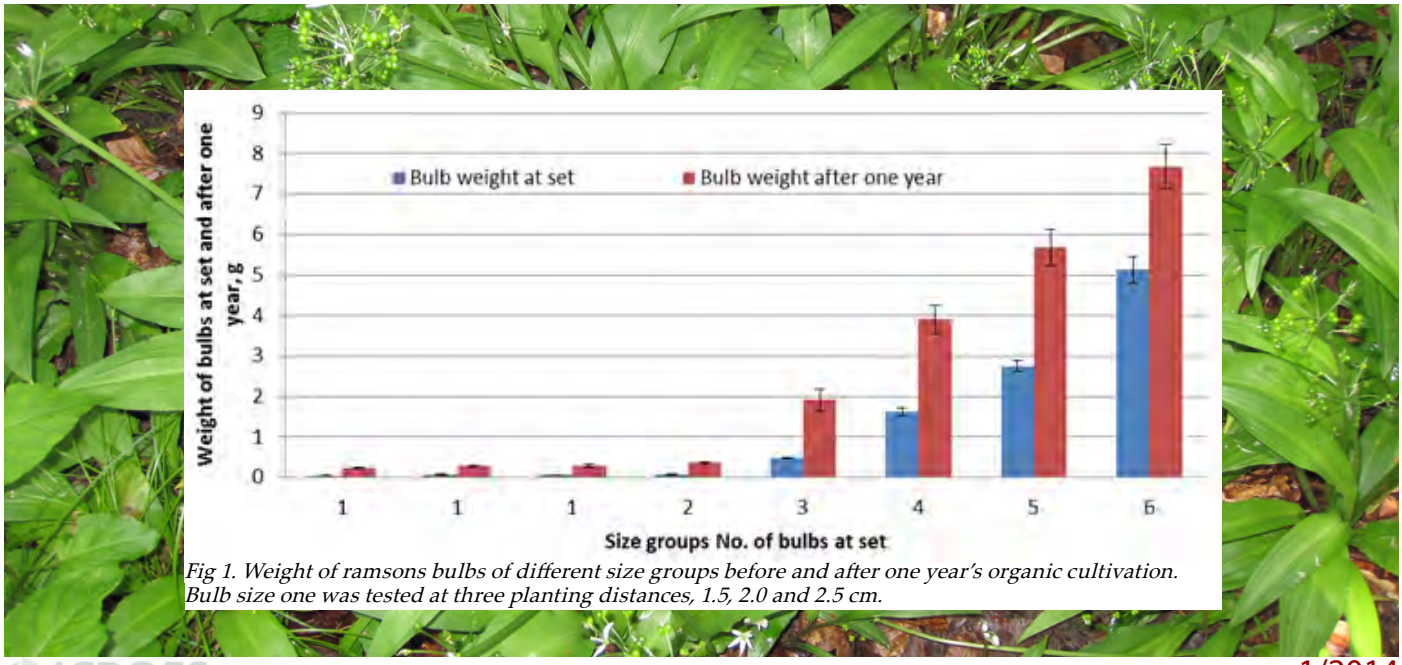


Fig 1. Weight of ramsons bulbs of different size groups before and after one year's organic cultivation. Bulb size one was tested at three planting distances, 1.5, 2.0 and 2.5 cm.

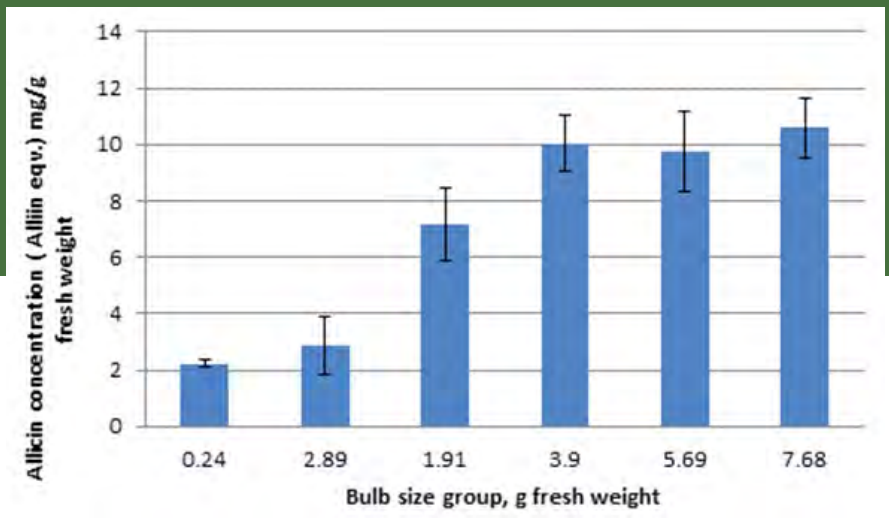


Fig 2. Concentration of allicin (alliin eqv) depending on bulb size.

test of allicin concentration in ramson bulbs depending on bulb size showed that young small bulbs with average fresh weight of 0.24 g/bulb only had low amount of allicin (2 mg/g), and that the concentration increased with increasing bulb weight up to 3.9 g bulb size (10 mg/g) and then leveled out in larger bulbs up to 8 g size (10 mg/g) (Fig.2).
The taste and odor of the bulbs of ramsons is by most people considered much stronger than from leaves and have an overlapping sensory profile with garlic, although some different taste aspects is found.

Supply: collection versus agricultural production

In Denmark and Western Europe, traditionally only the leaves are used for seasoning food, while the bulbs and flowers are also used in Eastern Europe. Until now almost all supply of ramsons, rely on harvesting from natural wild forest populations. Ramsons in nature are growing in fertile beech forests and harvest of leaves is fairly easily done here and allows regeneration from the bulb next year. Harvest of bulbs of ramsons in natural forest would likely both threaten the wild populations over time and also involve large constraints to retrieve bulbs from the forest soil filled with tree roots. If ramson bulbs and leaves in the future should meet the increasing supply demand of worldwide consumers, a mechanized harvest would be necessary and would require efficient cultivation methods on agricultural land.

Cultivation methods

As a first step in the development of a cultivation method, we investigated the growth of 6 different bulb sizes from approx. 0.1 g to 5 g in order to develop a growth model and to predict how many years a production may take to obtain an acceptable size of the ramson bulb. Resting bulbs of ramson, collected in nature were graded in different sizes and planted in individual depths and distances depending on size in a clay soil in the autumn. They were allowed to grow in one season with 100 kg organic N/ha and with supplemental irrigation and shade applied. Resting bulbs were retrieved in September and weighed individually and the weight and relative increase of weight were calculated for each size. Small bulbs less than 1 g size increased their fresh weight 3.5 - 4 times after one year, whereas larger bulbs only increased their weight 2.5 – 3.5 times (Fig.1). Large bulbs between 2-5 g showed the largest increase in weight equal to on average of 3 g increase/ bulb - equal to 8,250 kg/ha/year with a bulb square distance of 6 cm (machine tracks not subtracted). In bulbs over 3 g size double bulbs will develop by division with higher percentage the larger the initial bulb size. Setting bulbs of 5 g resulted in 25 % double bulbs. Similarly only large bulbs will flower, and again the larger the bulb, the higher percentage of flowering. 4-5 years cultivation is likely necessary to produce a good sized ramson bulb of 7-9 g from seed. In our experience artificial humid and cold storage at 1°C of resting bulbs, result in sprouting in January - February and longer storage i.e. until spring time, is therefore a challenge.

A display of bulbs, flowers, stem and leaves. Photo: AU Food Science

Ramson seeds studies

Studies with ramson seeds were also undertaken in order to establish a method for breakage of seed dormancy with subsequent field sowing trials. The dormancy is thought to be released by a combined warm and cold stratification. Seeds collected in nature were dried and cleaned in a greenhouse and stored at -5°C. Imbibed seeds were subjected to 1 or 2 months of moist warm stratification at 20°C followed by cold stratification at 4°C until germination. Only very few seeds germinated and it may well be, that the Danish seeds need longer warm stratification than seeds of more southern European origins.

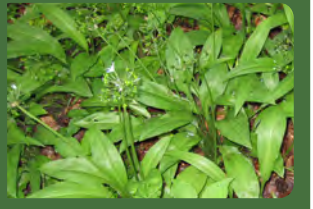
An interesting crop

In conclusion, ramsons is a very interesting crop with unique taste and strong antibacterial activity as a result of the high content of sulphur containing compounds.

An increasing demand for leaves and bulbs will require the development of an efficient horticultural cultivation method and our first results suggest that such a method can indeed be developed.

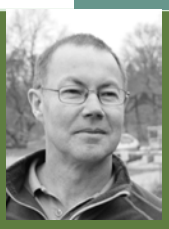
More information

Read more about the Organic RDD project Berrymeat at: http://www.icrofs.dk/Sider/Forskning/organic-crdd_berrymeat.html



Organic RDD is financed by the Ministry of Food, Agriculture and Fisheries and coordinated by ICROFS.

Climate impact of mobile green manures



By Søren O. Petersen and Peter Sørensen, Department of Agroecology, Aarhus University

Climate impact should be taken into account when evaluating the sustainability of cropping systems. We determined emissions of greenhouse gases during storage and after field application of fertilizer products for organic crop rotations: Grass-clover cuts that were either ensiled or composted, and plant biomass which was co-digested with slurry. Both digestate and grass-clover silage showed positive results with respect to added crop yield and climate impact.

Livestock manure, mostly slurry, is part of fertilizer plans on many organic farms, but often has to be imported from conventional farms. In order to reduce the dependency on conventional manure, alternative strategies to ensure nitrogen (N) supply to crops in organic rotations are currently explored. They include anaerobic digestion of plant biomasses, and so-called mobile green manure.

The N value of limited amounts of available slurry may be increased via co-digestion with plant materials in biogas plants. During this treatment, organically bound N is mineralized from both slurry and plant biomass. Green manure is an important source of N in organic crop rotations, but traditional cuts where the plant material is left to decompose in the field has a high risk of both atmospheric losses and N leaching that will reduce the fertilizer value for a subsequent crop. Harvesting and storage of green manure, either as compost or as silage, are alternative strategies for better N use efficiency, because the green manure can then be reallocated to phases of the crop rotation where it will result in the highest yields.

The greenhouse gas balance, like the N balance, reflects the sustainability of the cropping system. As part of an overall evaluation of mobile green manure and co-digestion it is therefore important to quantify and balance yield increase against climate impact.

Emissions of greenhouse gases

The most important contributions to the greenhouse gas balance of agriculture come from methane and nitrous oxide which are both powerful greenhouse gases compared to CO_2 (25 and 300 times, respectively, over a 100-year period). Methane is produced in the digestive system of livestock and during subsequent storage of the manure. Nitrous oxide is also produced during manure storage, but mainly in agricultural soils where both fertilizer products, N fixed by legumes, and crop residues are important sources. Also, ammonia losses and N leaching are indirect sources of nitrous oxide. Both methane and nitrous oxide are produced by microorganisms in oxygen deficient environments.

The greenhouse gas balance of a farm includes all these sources. Other relevant sources are the use of fossil fuels on the farm, which could partly be compensated by energy from biogas production, and imported feed which could increase if grass-clover or other crops are instead used as fertilizer.

Greenhouse gas balance for storage and field application

As part of the research project HighCrop, a study has been conducted which may help evaluate the climate impact of mobile green manure. Here, grass-clover and lucerne were ensiled in plastic-wrapped bales or composted after admixing of chopped straw. Composting and ensiling took place in the period from August 2011 to April 2012, side by side with slurry co-digested with plant biomass (mostly maize silage in this study) and untreated cattle slurry. Unfortunately it was not possible to include also materials with lucerne in the study of greenhouse gas emis-

Pilot-scale storage facility used in this study.

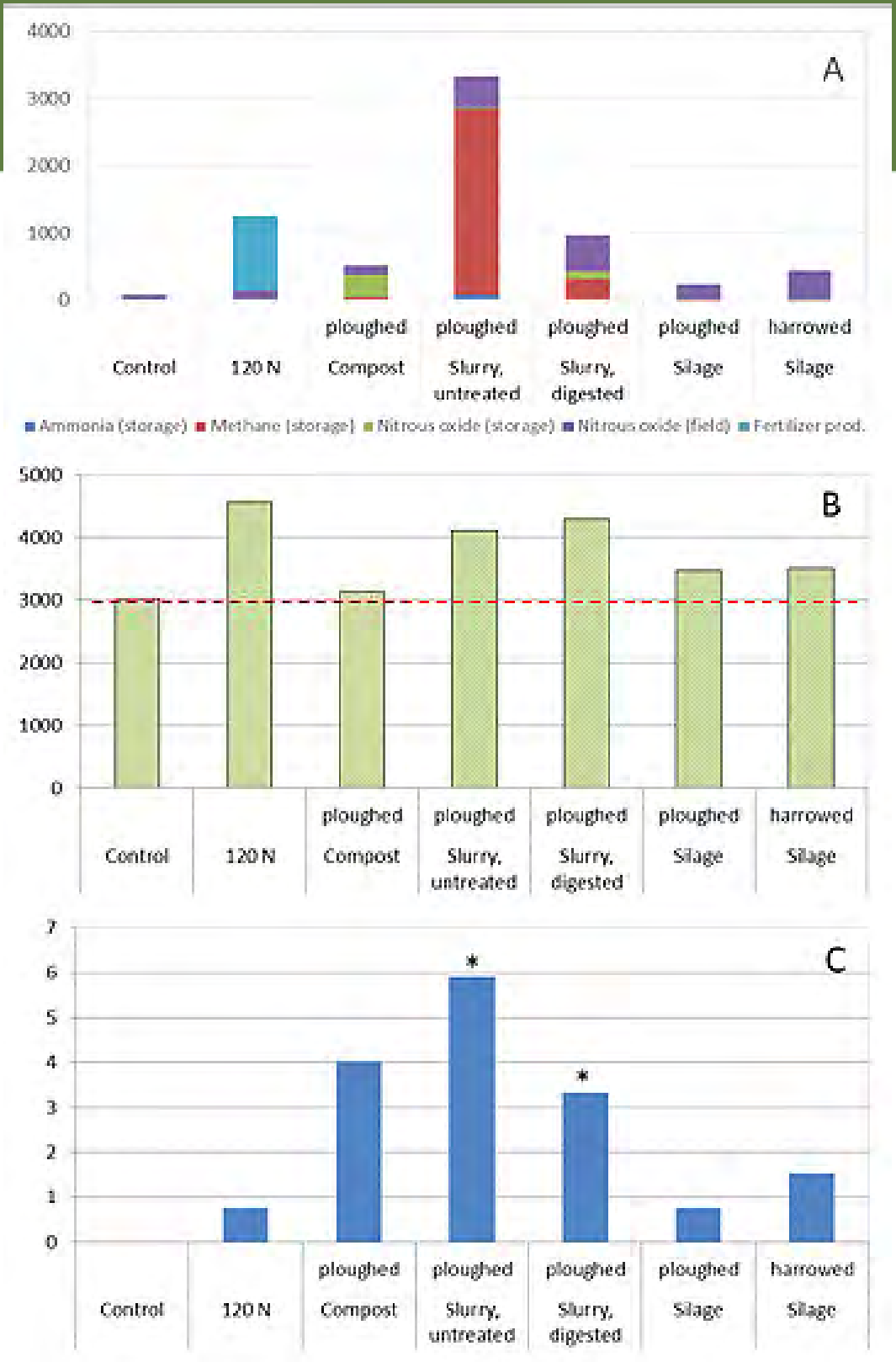


Figure 1.
A. The total climate impact (kg CO_2 equivalents per hectare) as ammonia, methane and nitrous oxide during 7-8 months storage and after field application of compost and silage of grass-clover, untreated cattle slurry, and slurry co-digested with maize silage. The field experiment also included treatments with mineral N fertilizer and an unamended control.
B. Yields of spring barley (kg dry matter in kernels per hectare). The red line marks the yield in the unamended control. Energy use for fertilizer production is included.
C. Climate impact relative to yield increase (kg CO_2 eq per kg dry matter in kernels). Compost and silage was surface-applied and incorporated by ploughing unless otherwise stated. Slurries were injected, followed by ploughing.
(A theoretical value for methane emission from cattle was included in the greenhouse gas balance for slurry).*

sions. Emissions of methane, nitrous oxide and ammonia were quantified, and all materials were characterized at start and end of storage.

In April 2012 the four fertilizer materials were used as N source for spring barley with application rates targeting 120 kg N per hectare. An unamended control and a treatment receiving 120 kg N in mineral fertilizer was also included. Emissions of nitrous oxide were monitored during six weeks. By this time the growing crop had depleted plant available N in the soil.

Figure 1A shows the total emission of methane and nitrous oxide during storage and in the field, expressed as CO_2 equivalents per hectare. For mineral fertilizer the energy used for the production was the largest source of greenhouse gases. Untreated slurry was the overall largest emitter of greenhouse gases, especially as a result of methane emissions during storage. The digestate, which released much less methane during storage, formed a thick surface crust partly from maize silage residues.

It is also notable that the emission of nitrous oxide during composting of grass-clover was significant. Composting is a process with a high oxygen demand, and it is well known that oxygen deficiency can develop underneath the compost surface where formation of nitrous oxide can occur.

Climate impact and crop yield increase

Emissions of greenhouse gases can not alone reveal which fertilization strategy is more sustainable. Here it is necessary to also compare with the yield increase resulting from the fertilization. Yield increases in this study

can be seen in Fig. 1B (areas above the dotted line). Only cattle slurry and co-digested slurry gave yields at the same level as mineral fertilizer. The last sub-plot, Fig. 1C, shows the total greenhouse gas emission per kg extra dry matter in kernels. Note that for treatments with slurry a theoretical value for methane emissions from cattle was included. Composting of grass-clover/chopped straw was nearly as critical in terms of climate impact as untreated slurry. Co-digested slurry gave a high added yield with substantially less emission of greenhouse gases compared to untreated slurry. For silage of grass-clover, the emission of greenhouse gases was very low, but the added yield (Fig. 1B) was also moderate.

Shallow incorporation of grass-clover silage by harrowing resulted in higher nitrous oxide emissions than ploughing. This was due to high emission rates in the first few days and may reflect a better contact between silage and soil containing nitrate which is needed for nitrous oxide formation in this early phase.

Both mineral fertilizer and manure are sources of greenhouse gases "up-stream" from the field application. In this study, co-digestion of slurry and plant biomass nearly cut emissions per added yield by 50% compared to untreated slurry, even without accounting for energy substitution. Silage of grass-clover had a lower N fertilizer value than the co-digestate, but also a very low climate impact. It should be mentioned that silage of lucerne had a higher N concentration than silage of grass-clover and gave yields at the same level as the slurries. Unfortunately the lucerne silage could not be included in this study of climate impact.

Silage is characterized by better conservation of nitrogen compared to composting or simple cutting, since environmental losses from the harvested biomass are largely prevented during the winter months. In light of the low climate impact of this material, more knowledge should be acquired on the best agronomic use of ensiled green manure materials.

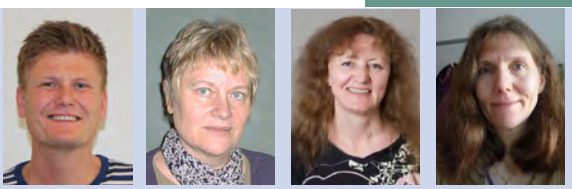
More information

Read more about the Organic RDD project HighCrop at: http://www.icrofs.dk/Sider/Forskning/organic-rdd_highcrop.html

Organic RDD is financed by the Ministry of Food, Agriculture and Fisheries and coordinated by ICROFS.

Organic rainbow trout

– Does the diet composition influence the fish health?



By Hans-Christian Ingerslev, Inger Dalsgaard, Mette Boye and Lone Madsen,
National Veterinary Institute, DTU, Denmark

Rainbow trout (*Oncorhynchus mykiss*) is the dominant fish species in Danish aquaculture and the production is yearly about 40.000 tons. Freshwater accounts for about 75% of the production, while the remaining comes from seawater. During the last few years an organic fish production has been initiated and the rates of farmed organic fish are continuously increasing. Antibiotic treatment is only allowed a limited number of times during the entire life of an organic fish and if more treatments are needed the fish must be sold with the status of being conventionally raised. Thus it is a challenge to prevent disease outbreaks, e.g. by feeding with diets providing optimal health for the fish by strengthening their immune system or the composition of the gut microbiota.

Photo: Fiskehuset Thisted Aps

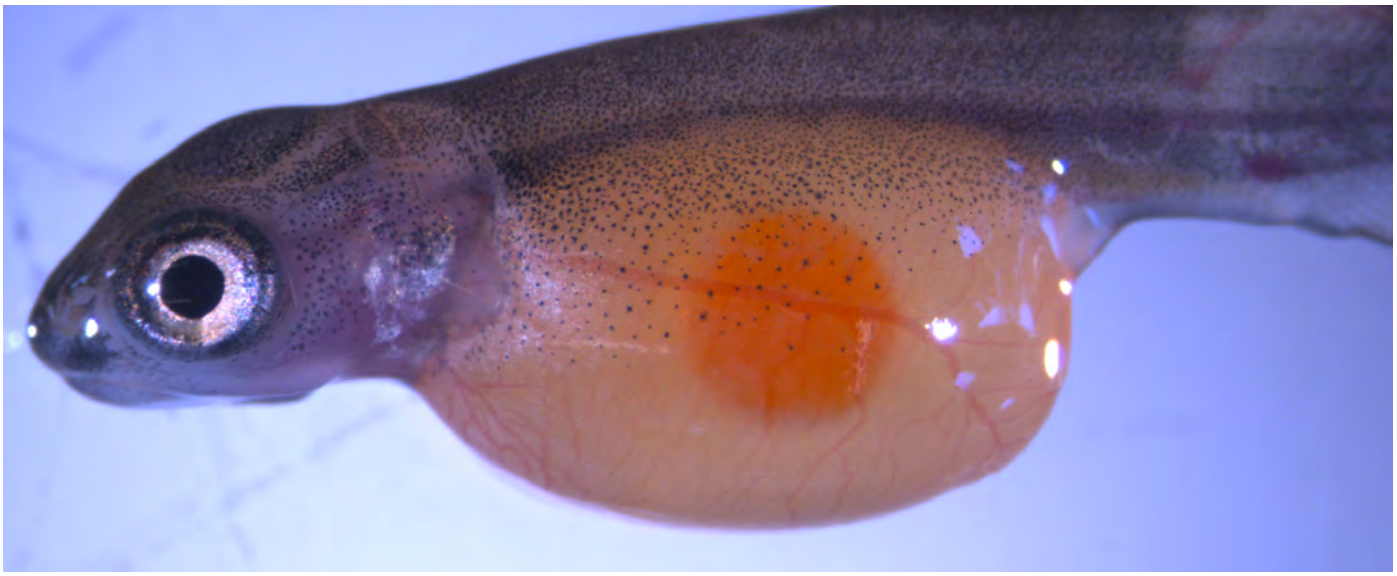
Fish may become infected at all life-stages. At the fry stage it is especially two bacteria that are causing problems in the Danish aquaculture rearing systems; *Flavobacterium psychrophilum* and *Yersinia ruckeri*, which are the causative agents of 'rainbow trout fry syndrome' (RTFS) and 'enteric red mouth disease' (ERM). Today vaccines exist against ERM, but not against RTFS. However, even if vaccines did exist against both diseases the fish would be at risk of experiencing disease outbreaks at the fry-stage, resulting in repeated antibiotic treatments and consequently the loss of the organic declaration. In order to produce organic fish fry it is necessary to obtain optimal conditions in order to prevent outbreaks of disease. One way to achieve this is to optimise the fish feed.

Fish feed may originate from different sources

Traditional fish feed for use in aquaculture is made from oil and meal originating from marine wild-caught fish – usually sand eel, sprat or whiting. Due to world-wide limitations of marine fish stocks, which are caught for use in the production of fish-feed, the fish feed producers are to some degree replacing the marine content with plant ingredients. Previous experiments have shown that the intestinal mucosal layer in the fish is influenced by some plant sources. Hence, the consequences hereof on the immune system and the survival in connection to challenge by RTFS and ERM are under examination in the Organic RDD-project OPTIFISH. Both marine and plant sources can be obtained as declared organic, and one of the aims in the project is to determine the optimal diet constitution for healthy rainbow trout fry.

Beneficial bacteria as additives in the feed

Another task in the project OPTIFISH is to study whether fish feed can be optimised by addition of



OPTIFISH is a corporative project with participation of universities and private companies. The project is headed by the National Veterinary Institute at DTU and the other partners are Faculty of Health and Medical Sciences, University of Copenhagen, BioMar A/S and Dansk Akvakultur (Danish Aquaculture Organization).


Photo: BioMar A/S


Photo: BioMar A/S

beneficial bacteria; the so-called probiotic bacteria.

Previous research has shown that the immune system of the fish is strengthened, which hopefully should improve the chance for survival in connection to infection or even better: prevent the disease from successfully infecting the fish. Probiotic bacteria may work in different ways, but one of the mechanisms of action is that the bacteria by growth and colonisation may create a layer on the surface of the intestine, preventing undesirable bacteria to enter the host tissue.

Furthermore the presence of probiotic bacteria may inhibit the growth of undesirable, pathogenic bacteria due to the production of inhibitory substances like bacteriocins and lactic acid leading to decreased pH in the intestine. More specifically, OPTIFISH examines whether addition of probiotic bacteria to the fish feed influences the immune system and survival of the fish after challenge with the pathogenic bacteria leading to RTFS and ERM.

Do the intestinal bacteria of the fish affect its health?

Other aspects of the project are to characterise the intestinal bacterial communities of the fish in relation to the diet type and examine the influence on the immune system and role in connection to infection. In the project the fish are monitored from the very early life-stage (shortly after hatch of the egg) and for several months after having been fed with diets containing varying amounts of marine /plant content, probiotics, as well as being of conventional or organic origin.

Together, the experiments in OPTIFISH should result in more knowledge about what is the optimal diet composition, which hopefully will lead to fewer outbreaks of disease, higher survival rates and a smaller consumption of antibiotics for organic rainbow trout fry.

More information

Read more about the Organic RDD project OPTIFISH at: http://www.icrofs.org/Pages/Research/organicrdd_optifish.html

Organic RDD is financed by the Ministry of Food, Agriculture and Fisheries and coordinated by ICROFS.

Publications

SOLID News no. 5

Read articles and other news from the SOLID project in the newsletters "SOLID News". SOLID is a European project on Sustainable Organic and Low Input Dairying. Read more about SOLID at www.solidairy.eu

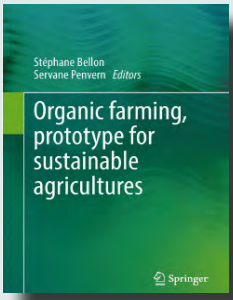
First newsletter from OrAqua

The first issue of the OrAqua Newsletter has been released. OrAqua is an EU project that runs from 2014 -2017. The full name of the project is: European Organic Aquaculture -Science-based recommendations for further development of the EU regulatory framework and to underpin future growth in the sector. In this first newsletter you can read more about the work and content of the project. We also encourage you to sign up for the upcoming Oraqua stakeholder event, taking place prior to the IFOAM World Congress in Istanbul in October 2014 or to visit the project website: www.oraqua.eu

Organic Farming, prototype for sustainable agriculture

Rather than questioning whether organic farming performs better or not than conventional farming, the main question addressed in this book is how and under what conditions OF&F may contribute to sustainable agricultures. Multiple forms are emerging today, among which OF&F represents a prototype, evolving in strong interaction with them and tackling the multiple challenges facing sustainable agriculture.

Read more...



Conferences

International Congress: 7-9 July 2014, France

Diversity strategies for organic and low input agricultures and their food systems. SOLIBAM final congress: 7-9th July 2014 in France. Read more at: https://colloque.inra.fr/solibam2014

NJF seminar: 15-17 July 2014 Åland, Finland

Nordic heritage varieties of cereals
History, cultivation, breeding, milling, baking, brewing, food quality and health. Topics at the seminar:
The genetic material of heritage varieties in the gene banks
Plant breeding for organic farming
The history of Nordic cereals
Health aspects of cereals
Baking and added-value processing with old varieties
Seed laws and biodiversity.
Read more at: http://composit.dimea.se/www/njf/site/seminarRedirect.asp?&p=1004&intSeminarID=474

Conferences

ESA congress, 25-29 August, Hungary

The XIIIth congress of the European Society for Agronomy will take place between 25-29 August 2014 in Debrecen, Hungary. Read more at: http://www.esa2014.hu/

The

The 65th Annual Meeting: 25-29 August 2014, Copenhagen

The 65th Annual Meeting of the EAAP will take place in Copenhagen from 25th to 29th August 2014. Read more at: http://www.eaap2014.org/

Organic World Congress, held in Istanbul, Turkey, 13 - 15 October 2014

The congress is gathering the global Organic Movement every three years. 2000 people from all continents debate issues, inspire each other, learn altogether and take strategic decisions. The 2014 conference will have 3 themed tracks, The Main Track, The Scientific Track, and The Practitioners' Track as well as a series of Workshops. Read more at: http://www.owc2014.org/