Funding: The Finnish Ministry of Agriculture and Forestry and MTT (currently Natural Resources Institute)

Implementing IPM in strawberry production by utilizing demonstration farms and expansive learning

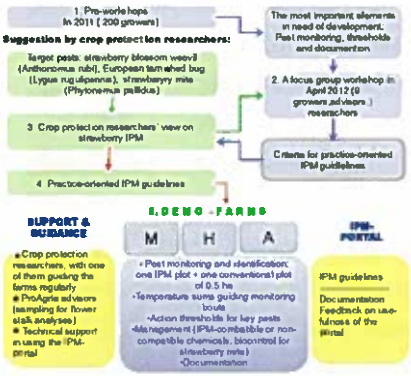
Irene Vänninen[1], Kati Nieminen[2], Isa Lindqvist[1], Tuomo Tuovinen[1], Pertti Rajala[3], Jani Hyytiäinen[4], Anne Nissinen[1]

[1]Natural Resources Institute, Jokioinen; Finland; [2]Univ. Helsinki, Dept. Agric. Sci.; [3]The Plant Protection Society, Helsinki; Lojaali Interactive Ltd.

Introduction

The implementation of IPM should take place by taking into account the local contingences of individual farms that can be understood as activity systems. We argue that a localized developmental view based on the cultural-historical activity theory (CHAT) and expansive learning (1) can capture locally conditioned learning challenges to better understand the dependency of IPM implementation on conditions of individual farms. The EU directive 128/2009 represents a new rule for pest management activity of farms and involves the adoption of new tools and mabye even a new conception of pest management, depending on the level of previous IPM use by farms. We report here how the learning challenges associated with IPM implementation were studied in three strawberry farms and how the farms could be profiled in terms of their expansive learning actions during implementation of IPM elements new to the farms: a monitoring method for key pests, identification of the pests, use of biocontrol and use of a demo-version of an IPM-portal for delivering IPM guidelines and documenting IPM actions.

Methods 1: Organizing the research activity 2: Flower stalk analysis 3: Analysing expansive learning actions



Recorded, semistructured interviews of growers for analysis of expansive learning actions (ELAs) from thematic episodes and speaking turns. Graphical results of flower stalk analysis as a boundary object supporting mutual learning of growers and researchers on IPM success.

Flower stalk analysis was carried out at the beginning of picking. All flower stalks from 20 plants/plot (0,5 ha) were collected and analyzed (Tuovinen & Lindqvist, 2013):

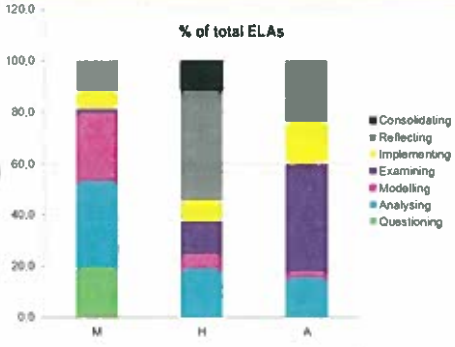
- all 1st to 4th stage berries, flowers and buds were counted
- each component was classified according to the known cause of damage: e.g. strawberry blossom weevil (cut bud stem), plant bugs (malformed), thrips (bronzing), grey mould (brown spot)
- ripe berries by stage were weighed individually and reference weight data of 1st, 2nd and 3rd stage berries were collected
- as a result, an estimate of the yield potential and losses due to various factors was calculated per plant and per hectare.

Results of the analyses in graphical form were used during the interviews as a mediational tool to induce expansive learning in the interviewees.

ELA	What does it mean?
Questioning	Questioning, criticizing, or rejecting some aspects of the current practice and existing wisdom; also: questioning and rejecting the offered new practice.
Analysing	Analysis of the current situation in order to find out origins and explanatory mechanisms.
Modelling	Modeling the explanatory relationship by constructing an explicit, simplified model of the new idea, a germ cell, that explains the problematic situation and offers a perspective for resolving and transforming it.
Examining	Running, operating, and experimenting on the new model ("on paper", so to speak, i.e. cognitively) in order to fully grasp its dynamics, potentials, and limitations, discussing the model critically and enriching it.
Implementing	Putting the new model in practice or reporting on it implementation.
Reflecting	Reflecting and giving feedback on the process of implementation and learning.
Consolidating	Making the new practice as a routine part of practice in the farm, and expanding it to other contexts than the original one.

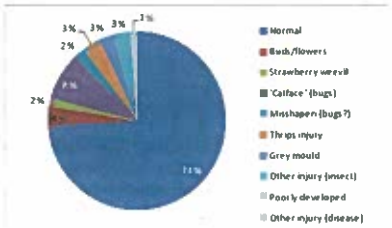
Engeström et al. (2013)

Results and Discussion



The interviews lasted 1.5-2 h and contained 373-579 speaking turns. The distribution of ELAs in the discourse differed considerably between the farms (figure above):

- **Farmer M** implemented the new IPM elements only to a limited degree, and questioned critically the new monitoring method and his own agency. Identifying needs, problems and contradictions in the IPM and farming activity in general formed the majority of his ELAs. He struggled to decide which learning challenges to address first. Leaning on the experience from the trials and supported by the interventionist, M gradually crafted a crude new model of basic pest management that addressed both his short-term and long term needs and gaps in pest management, including tools and information acquisition. This resulted in concrete actions in the next summer, e.g. he purchased a new spraying machine. The flower stalk analysis did not induce expansive learning actions from M.



No. of flowerstalks/plant	10.1	Direct loss: insects	33.1 g
Berry weight (1st stage)*	19.7 g	Direct loss: diseases	20.6 g
Potential berry yield *:	684 g	Undamaged yield/plant	530.4 g

* Excluding poorly developed, buds & flowers at the inspection time

An example of the results of the flower stalk analysis from farm H IPM-plot. For key pests, results from IPM plots and the reference plots were similar in all farms, thus the selective chemicals used in the IPM-plots produced a similar control efficacy as the combination of non-selective and selective pesticides in the reference plots.

- **Farm H** implemented the new IPM elements successfully. The majority of their ELAs were about reflecting the process during the summer. The new IPM elements suited their needs and were integrated smoothly with the existing activities, therefore problem analysis, modelling and examining the given IPM model were less frequent. H was the only farm that successfully adopted the use of the IPM-portal's demo-version and gave critical feedback on it. H expanded the use of the new IPM elements to another crop (raspberry). Consolidation of the new IPM elements by the family members themselves was evident.

- **Farm A** approached IPM strategically: they wanted to improve marketing of their products by using it. Examining the given IPM model dominated their ELAs: they discussed the model in length critically and enriched the temporal aspects of monitoring. Outsourcing the monitoring for key pests became their consolidated solution after the project ended. A – as well as H – expansively discussed the results of flower stalk analysis.

The analysis of discursive expansive learning actions helped understand why the offered IPM elements either could or could not be incorporated in the activities of the farms, showing the influence of local contingencies on the farms' ability to deal with the learning challenges when implementing IPM. Farms such as M particularly that face a multitude of problems can be better supported in their attempts to develop their activity on the basis of structuring their learning challenges with the analysis.

References:

1. Engeström, Y. (987). Learning with expanding. Ph.D. thesis. Faculty of Behav. Sci. Available at: http://lchc.ucsd.edu/MCA/Paper/Engestrom/expanding/toc.htm
2. Engeström, Y., Rantavuori, J., & Kerosuo, H. (2013). Expansive learning in a library: Actions, cycles and deviations from instructional intentions. Vocations and Learning, 6(1), 81-106.
3. Tuovinen, T., Lindqvist, I. (2013). Flower stalk analysis as a tool for evaluation of the success of pest control in strawberry. In: IPM in Nordic and Baltic berry crops : NJF seminar 465, 12-13 November 2013, University of Copenhagen, Denmark. NJF Report 9 8: p. 40.