Routes of change analysis to show the diversity of farmers' learning processes : the reduction of input use in field crop farms

Emilia Chantre, Marianne Cerf, Marianne Le Bail

in FSD 2009.

ROUTES OF CHANGE ANALYSIS TO SHOW THE DIVERSITY OF FARMERS' LEARNING PROCESSES: THE REDUCTION OF INPUT USE IN FIELD CROP FARMS

Chantre E.*[1], Cerf M.**, Le Bail M.*
*AgroParisTech, UMR 1048 INRA-AgroParisTech SAD-APT
** INRA, UR SenS, IFRIS
[1] presenting author, email: emilia.chantre@grignon.inra.fr

INTRODUCTION

To enable agriculture to maintain a high productivity level and decrease its negative environmental impact on a long-term basis, one approach is to promote learning processes among farmers. Some agronomists have already pointed out that learning processes are part of farming system leeway (Navarrete et al., 2006) or flexibility (Dedieu et al., 2008). While learning processes are seen as key factors in decision support (McCown, 2002), they have not yet been characterized. Hence, our research aims at analyzing the diversity of farmers' learning processes when farmers change their practices (decreasing the use of chemical inputs: fertilizers, pesticides and fuel) during their professional career.

MATERIALS AND METHODS

Our hypothesis is that there is a diversity of routes of change to reduce the use of inputs on the one hand and a diversity of learning processes on the other. Routes of change are meant to give an account of the temporality and of the complex combination of changes in practices occurring during the farmer's career. For each change, we have highlighted the learning processes which occurred. Learning processes encompass training, social learning and learning in action. We acknowledge them by identifying the nature of what was learnt, the resources mobilized and the different steps followed to learn, e.g. the state of alert (problem, idea, go click), the experimentation, the validation. Finally, to quantify the input reduction, based on recordings made by farmers, we calculate a series of indicators at different periods and at different scales (crops and farm).

We carried out farm surveys (20 in Champagne Berrichonne, France, territory of field crops) among farmers who now perform low-input agriculture. Interviews dealt with the technical, agronomic, economic and informative dimensions of farm work for a period covering the professional career of the farmer (6 hours of survey/farmer in two sessions).

RESULTS AND DISCUSSION

In this paper, we have chosen to present two routes of change for two different farmers: both of the two farms are located on similar brown soil types (40mm< soil water reserve < 100mm) and both of the two farms use 60 $L.ha^{-1}$ of fuel for their crops in 2008, but their practices are different. We calculated indicators for nitrogen and pesticide utilization, average wheat yield and, to illustrate the learning processes, we show only the experimentation step to simplify.

Table 1 shows that if the reduction of nitrogen fertilization on wheat appears in both cases (meanwhile the average yield has not changed), it has not occurred at the same period and it does not have the same final results. For soil tillage or pesticide use we noticed differences in the nature, the dynamics and the intensity of practices over the period. Few changes in practice are stimulated by a change in environmental regulations (for nitrate and water). Our data however shows that the one farmer (farmer 1 in Table1) has used this change as an opportunity for him as well as for his development group to reduce nitrogen use to below the norm while maintaining the same level of income. The learning processes are also different. Indeed, the experimentation step can take different forms according to the way of appealing to the individual (shown in Table

1) as well as to the way of controlling the results of the experimentation. Experimentation is mainly carried out within a group or with a neighbour, and one farmer can have diverse ways of experimentation. The development group of the first farmer started reducing the input doses three or four years before the second one. If both farmers evoked their recent concern for the environment, they did not translate it into practice in the same way.

These first results encourage us to consider that our methodology is relevant to analyzing and identifying the diversity of learning processes as well as that of route of change within a given territory. The treatment of all data will make it possible for us to show specific connections between certain routes of change and certain learning processes in farmers' careers. Such an analysis, based on grounded surveys, will provide new insights to guide changes of practice. It can also complement approaches that aim at designing or improving farming systems.

REFERENCES

Dedieu, B., E. Chia, B. Leclerc, C.-H. Moulin and M. Tichit. 2008. L'élevage en mouvement, Flexibilité et adaptation des exploitations d'herbivores. Ed Quae, Paris.

Navarrete, M., M.l. Bail, F. Papy, F. Bressoud and S. Tordjman. 2006. Combining leeway on farm and supply basin scales to promote technical innovations in lettuce production. Agronomy for Sustainable Development 26:77-87.

McCown, R.L. 2002. Changing systems for supporting farmers' decisions: problems, paradigms, and prospects. Agricultural Systems 74:179-220.

Table 1: Two routes of change for two different farmers.

Headings	Route of change for Farmer 1	Route of change for Farmer 2
Time periods	1985 1990 1995 2000 2008	1988 1990 1995 2000 2008
Highlights of the farm	Adjustment of the practices to the neighbours / Reduction of the operating costs (inputs) / Environmental awareness and economic viability / Signing up an environmental contract	Introduction Of Irrigation / Reduction of the operating costs (inputs) / Sharing of equipment and manpower / No-till seeding
UAA per AWU (AWU)	80 (1) / 80 (1) / 105 (1) / 115 (1)	217 (1) / 200 (5)
Rotation	WR or S/ WW / WB / WR or S / WW / SB or WB or WW	C / SB / WW / P / Se B / C / SB / WW / R / WW / C / SB
% of tilled area	65 / 65 / 25 / 50	70 / 0 / 0
Seeding	Decrease in density / More resistant varieties (in 2008, wheat density is 200-250 grain.m^{-2})	Decrease in density (in 2008, wheat density is 250 grain.m^{-2})
Fertilization Average N on wheat (unit.ha^{-1})	160 / 150 / 140	200 / 200 / 170 / 170
Herbicides, Fungicides, Insecticides.	Dose reduction	Dose reduction
Growth regulator	Never used	Used / Stopped using
TFI: % of the 2008 regional reference	Farm-scale TFI for herbicides in 2008: 73 % Farm-scale TFI for other pesticides in2008 : 25 %	Farm-scale TFI for herbicide in 2008: 92 % Farm-scale TFI for other pesticides in 2008: 84%
Wheat Yield (average 5 yrs)	5,5 Mg.ha^{-1} Regional average is 6,2 Mg.ha^{-1}	7 Mg.ha^{-1} (irrigation).

Caption			
UAA, AWU	Usable Agricultural Area (Hectares), Annual Work Unit		
Crops in the rotation	C: corn; P: peas; W R: Winter Rapeseed; S: Sunflower; SB: Spring Barley; Se B: Seed-bearing; WW: Winter Wheat; WB: Winter barley; For example, "R / W" stands for a rotation of Rapeseed the first year and wheat the second year.		
N	Nitrogen (unit. Ha^{-1})		
TFI	Treatment Frequency Index: this index posts the number of standard doses of pesticides applied on one hectare for one agricultural year. The standard dose is the efficient dose applied on one culture for one pest or one weed. TFI can be calculated at the scale of a crop, as well as the scale of a farm. Here we distinguish the TFI for herbicide and TFI for the other pesticides.		
	Experimentation alone		Experimentation with a peer
	Experimentation with a development group		No experimentation
	Change due to the regulations impacting practices:		