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Paris, October 18, 2022

Title Page

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Declaration of interests :

☒ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Abstract

Sustainability transitions present specificities that call for an adaptation of public policies. So far, little research has focused on adapting policy processes, despite their importance in shaping policy instruments. To fill this gap, we analyzed the elaboration of the French pesticide reduction plans, which aimed at a 50% reduction over 10 years, without succeeding. We used the management situation concept and the transitions of sociotechnical systems framework to understand what limited the State's capacity to manage the creation of a transition plan. We show three sources of interdependent blockages: (i) Deficiencies in collective sensemaking processes; (ii) Non-systemic instruments definition approaches; (iii) Implementation based on delegations and fragmented action. We propose a framework for adapting policy processes to transitions characteristics and show its complementarity to *Transition Management*. We show that a pragmatist management approach allows to link transitions theories and operational action. We believe these results can provide inspiration for policy-makers.

Keywords: pesticide reduction; lock-in; policy process; transition management; management science; sociotechnical transitions

1. Introduction

In Europe, reducing environmental and health nuisances associated with the use of pesticides is now a public policy objective. European Directive 2009/128/EC thus requires Member States to adopt national plans aimed at reducing the "*risks and effects of pesticides on human health and the environment*" and at limiting dependence on pesticides. However, to date, the sale of pesticides has not decreased on the European continent (Möhring et al., 2020) and the reduction of pesticides appears to be a wicked problem (Rittel and Webber, 1973; Guichard et al., 2017). Developing public policies for the transition to reducing pesticides is indeed a complex objective because of the central place occupied by these technologies in European cropping systems (Butault et al., 2010; Kuokkanen et al., 2017; Möhring et al., 2020). In several countries, a lock-in phenomenon has been highlighted, that excludes breakthrough innovations that are not compatible with the sociotechnical system built around pesticides (Wilson and Tisdell, 2001; Vanloqueren and Baret, 2009; Lamine et al., 2010; Guichard et al., 2017; Kuokkanen et al., 2017; Magrini et al., 2018; Oliver et al., 2018). This system is stabilized by the interdependencies among its components, the alignment of its standards and the difficulty of acting on material artifacts and networks (Geels, 2004; Belmin et al., 2018). Achieving significant reduction therefore requires collective action among the different actors of the system, in order to prevent the transformation of one part of the system from being blocked by another, and therefore to allow a radical redesign of production systems simultaneously at the level of farms, territories, sectors and markets.

This necessity need to overcome the lock-in is a specific feature of sustainability transitions policies that has been analyzed within the *Sustainability Transitions Studies* literature (Köhler et al., 2019). This literature invites us to take an interest in both policy mixes and policy processes, as policy processes influence the choice and content of instruments (Loorbach, 2010; Voss and Bornemann, 2011; Kivimaa and Kern, 2016; Rogge and Reichardt, 2016). To our knowledge, little research has focused on the improvement of the tools used by policy-makers to manage transition policy processes, especially around the issue of pesticide reduction. This paper therefore aims at filling this literature gap by identifying elements that limit a State's capacity to develop public policies adapted to the transition towards the reduction of pesticide use.

To reflect on this question, it seemed crucial to us to start from a detailed study of current practices of policy makers. France, where the State is considered an important actor in the agricultural sector, constitutes a particularly heuristic case study. We analyzed the case of pesticide reduction policies in France: the Ecophyto plans. The first version, launched in 2008, aimed to reduce pesticides by 50% over 10 years, but did not allow the decrease of their use on the territory (Government of the French Republic, 2020). Several authors thus decried the unsuitability of the Ecophyto plans (Martin and Munier-Jolain, 2014; Ansaloni, 2017; Guichard et al., 2017), but no study focused on the policy processes that led to the definition of these plans. To analyze this case, we considered the development of the Ecophyto plans as a collective action that needed to be managed. We mobilized the framework of "management situations" proposed by Girin (2011), which puts forward criteria for defining a collective situation as *manageable*, and the framework of sociotechnical system transitions.

In the rest of this article, we first present our theoretical framework (part 2) and our research design (part 3). Then we present our results on how the collective action was organized in Ecophyto (part 4). On this basis, in the findings and discussion part (part 5), we isolate the elements that limited the State's capacity to manage the creation of a transition plan (part 5.1). This allows us to formalize a framework for analyzing policy processes and their adaptation to transitions in the cross-sectional discussion (part 5.2) and conclude in part 6.

2. Theoretical Framework

2.1. From Transition Management to management situations

To build our theoretical framework, we started from an analysis of the Transition Management approach (TM) (Rotmans et al., 2001; Kemp et al., 2007; Loorbach, 2010). TM offers a prescriptive framework for policy-makers to shape sustainability transitions (Köhler et al., 2019). It is structured in four steps (Loorbach, 2010) :

(i) Creating a "Transition Arena": "*a small network of frontrunners with different backgrounds"* where their various perceptions of a problem are confronted in order to build a shared vision of the future;

(ii) Translating this vision into a "Transition Agenda" integrated into networks and organizations, which sets intermediary objectives;

(iii) Operationalizing these agendas through concrete actions and experimentation;

(iv) Monitoring and evaluating the transition process.

TM offers an interesting perspective on possible ways to structure collective transition experiments and has been tested in several sectors (Vinnari and Vinnari, 2014; Kelly et al., 2018). Nonetheless, it has some limitations, which are underlined by Loorbach (2010): it has namely been conceptualized as a "*shadow track in which new visions, ideas, and agendas can be developed in a more innovative way than within the context of regular policy processes*". It therefore does not question how to adapt institutionalized policy processes to transition specificities. It is structured more as a way to *influence* standard policy processes through exploration, experiments and learning than as an approach to *manage* them (Wittmayer et al., 2018). It does not give tools or criteria to ensure that a collective involved in policy-making will be able to coordinate action successfully and reach its goal (Dumez, 2014). This is why, in order to reflect on an institutionalized policy process elaborated to manage a transition, we felt the need to use a theoretical framework specifically designed to analyze a management process itself: the concept of "management situation" (Girin, 2011), which stems from a pragmatist approach (Aggeri, 2017).

A management situation is a situation where collective action is made *manageable.* This concept was defined by Girin (2011) who presents it as a situation where*" participants are united and must accomplish, in a determined time, a collective action leading to a result submitted to an external evaluation".* This definition calls for several comments:

- The participants in a situation are both active in achieving the result and affected by the external evaluation. Other actors can contribute to the situation without being affected by the evaluation, in which case they are not considered participants (Girin et al., 2016).
- The idea of "result" does not imply that there is collective adherence to the objective: each participant may have their own reasons for participating (obligation, opportunity, etc.), but the obligation or intent to achieve the result dominates and unites the actions of the collective (Piraux et al., 2005).
- The notion of evaluation highlights that achievement of the result is not defined by the collective itself but rather responds to external criteria.
- A management situation can be composed of several nested sub-situations. These are generally linked together by the creation of delegations.

At the start of a management situation, participants are faced with strong uncertainties about the actions to be taken. They initiate a "process of inquiry"*,* which is a sensemaking process (Weick, 2005) aimed at creating knowledge to reduce uncertainties and create a *"coherent and meaningful*" understanding (Journé and Raulet-Croset, 2008). The inquiry does not correspond to a revelation of the attributes of a system but rather to the actors' construction of their vision of this system and its means of management. The confrontation of the participants' subjective interpretations allows progressive simplification of the problem, and *in fine* the emergence of interpretations that may differ but are compatible for collective action. This simplification allows the translation of the collective interpretation into actions (Journé and Raulet-Croset, 2008, 2012; Charrier et al., 2020). The management situation concept makes it possible to draw a framework for analyzing the evolution of the constituent elements of a situation to be managed, in particular when the latter presents strong uncertainties (Journé and Raulet-Croset, 2008;

Charrier et al. 2020). It is particularly relevant in the case of the Ecophyto plans, as it was a situation in which the participants had to collectively define the means of achieving a pesticide reduction goal despite strong uncertainties on the levers to be activated for that purpose.

2.2. Socio-technical systems transitions as systemic management situations

To analyze the management of a transition towards sustainability, the *Sustainability Transitions Studies* literature highlights several specificities to be taken into account (Köhler et. al, 2019):

1) Transitions are a collective phenomenon by nature: they correspond to the transformation of a sociotechnical system, which can itself be defined as "*a collective of stakeholders, their networks, their practices and knowledge, the technologies they use, their collective representations, and the standards and rules they adopt*" (Meynard et al., 2017 – from Rip and Kemp, 1998).
2) Supporting a transition involves defining multi-dimensional actions on the scale of the sociotechnical system. This multi-dimensionality integrates the spatial dimension (from the local to the international level), the position in relation to the dominant system (niche, regime, landscape – Geels, 2002) and the various links in a system. In the agri-food sector, these links correspond to all human and non-human actors of the chain from the production of agricultural inputs, the agricultural production, to consumption and waste management.
3) The transformations of the different links must be done in such a way as to allow their co-evolution and avoid blockages of one part by another, linked to lock-in.
4) Transitions towards sustainability present a strong "normative directionality": the targeted objective integrates by definition better health of the considered ecosystems.

We will use the qualification of "systemic" to describe the elements (innovations, instruments, plans, actions, etc.) that integrate the multi-dimensionality of the sociotechnical systems and aim to act on these different dimensions to support the transition process.

The framework of management situations is applicable to transitions of sociotechnical systems and sheds unique light on them, for three reasons. First of all, the collective dimension of transitions makes it relevant to analyze them using a framework that formalizes organized collective action. Secondly, the significance of the uncertainties and controversies around a transition makes it important to mobilize a management framework where the starting point is defined as an indeterminate situation, and where understanding of the actors is built as it goes. Finally, the normative objective of a transition (sustainability) echoes the notion of the result of a management situation: collective action is indeed directed toward a result that can be assessed.

3. Methodology

3.1. Case study description

In 2007, France set an ambitious target of reducing the use of pesticides by 50% over 10 years,

embodied in the "Ecophyto Plans" (Ministry of Agriculture and Fisheries, 2008; Ministry of Agriculture and Fisheries and Ministry of Ecology, Sustainable Development and Energy, 2015; Government of the French Republic, 2019). Studying the design of these plans seemed to us to be heuristic because the State positioned itself as the manager of a collective action, leaving ample room for multi-actor processes. The plans consisted of a wide mix of public policy instruments, some binding, others aimed at training, research or support for the actors. However, despite several years of implementation, the use of pesticides increased in France by 25% between the periods 2009-2011 and 2016-2018 (Government of the French Republic, 2020 – Fig. 2). Thus, this case study provides a certain historical perspective on a process that evolved over several years and under different governments.

3.2. Data collection

We carried out semi-structured interviews with the actors involved in the construction of the Ecophyto plans. To identify the first informants, we combined an analysis of archives and articles and conducted several exploratory interviews. We then proceeded according to a snowball approach, with each actor indicating other actors to contact. We continued the interviews until no more new information emerged and we had saturated the diversity of actors involved. The differences in the number of interviews by category of actor mainly resulted from the variation in the size of the structures and the difference in the number of people in charge of the Ecophyto plans who have succeeded one another within the same structure. In total, 26 semi-structured interviews, lasting a total of 37 hours and 20 minutes were conducted. Our work is based on these interviews (table 1) and a corpus of secondary data made up of written archives on the Ecophyto plans (table 2).

3.3. Data analysis

The interviews conducted were transcribed and the collected data analyzed according to the principles of Grounded Theory (Corbin and Strauss, 2014). This method "*allows theory building from field data*" (Hannachi et al., 2019). The coding (Ayache and Dumez, 2012) was done with NVivo® software through a thematic analysis. In order to avoid memorization and social desirability biases (Butori and Parguel, 2010), we used the principle of data triangulation (Flick et al., 2004). The rest of the analysis consisted of using a narrative approach (Abell, 2004; Dumez and Jeunemaître, 2005) on the development of Ecophyto plans, highlighting the starting point of the dynamics, sequences with relatively homogeneous dynamics, and the tipping points that initiated transitions between sequences. This method enabled us to identify several constituent pillars of collective action organized for the development of the plans and to characterize their evolution. Finally, the narration was summarized and formalized in an illustrative narrative diagram (Fig. 1).

Type of actor	Number of people interviewed
Ministry in charge of agriculture	4
Ministry in charge of the environment	2
Research institutes and technical institutes	7
Agricultural advisory organizations	5
Environmental NGOs	2
Organizations representing agricultural companies (pesticides companies and cooperatives)	4
Agricultural union and political figures	2
Total	26

Table 1: Number of people interviewed according to the type of structure

Reference	Document type
French Republic, 2006. Interministerial Plan for the Reduction of Risks Related to Pesticides 2006-2009.	French government action plan on pesticides preceding the Ecophyto plans
Aubertot, J.-N., Barbier, J.M., Carpentier, A., Gril, J.J., Guichard, L., Lucas, P., Savary, S., Savini, I., Voltz, M., 2005. Pesticides, agriculture and environnement. Reducing pesticide use and limiting environmental impacts.	Expert report from the National Institute for Agronomic Research on pesticides
Paillotin, G., 2008. Final report of the Chairman of the “Ecophyto 2018” Operational Committee.	Provisional report of the 1st Ecophyto plan produced by the Paillotin Operational Committee bringing together the various stakeholders
Ministry of Agriculture and Fisheries, 2008. Ecophyto 2018 plan to reduce pesticide use.	1st Ecophyto plan (2008-2018)

Ministry of Agriculture and Fisheries, 2009. Ecophyto Plan 2018 - Action sheets.	Sheets detailing the actions of the 1st Ecophyto plan, produced by the Agriculture Ministry's administration
Butault, J.-P., Dedryver, C.-A., Gary, C., Guichard, L., Jacquet, F., Meynard, J.-M., Nicot, P., Pitrat, M., Reau , R., Sauphanor, B., 2010. Summary of the Ecophyto R&D study report.	"Ecophyto R&D" report by the National Institute for Agronomic Research on pesticides to shed light on the feasibility of achieving the objective set by the 1st plan
Ministry of Agriculture and Fisheries, Ministry of Ecology, Sustainable Development and Energy, 2015. Ecophyto 2 Plan.	Ecophyto 2 Plan (2015-2025)
Potier, D., 2014. Pesticides and agro-ecology, the fields of possibilities.	"Potier" report: evaluation report of the 1st Ecophyto plan
Government of the French Republic, 2018. Action plan on phytopharmaceutical products and agriculture less dependent on pesticides.	Pesticide use reduction plan drafted in 2018 following a multi-stakeholder conference organized by the State – subsequently integrated into the Ecophyto 2+ plan
Government of the French Republic, 2019. Ecophyto 2+ Plan.	Ecophyto 2+ Plan (2019-2015)
Court of Auditors, 2019. Summary procedure S2019-2659 - The results of the Ecophyto plans.	Summary evaluation of Ecophyto plans by the French Court of Auditors
Philippe, E., 2020. Response of the Prime Minister to the summary procedure of the Court of Auditors on the Ecophyto plans.	Response of the Prime Minister to the summary procedure of the French Court of Auditors on the Ecophyto plans.

Table 2: List of archives on Ecophyto plans analyzed

4. Results

We present the results in the form of a narration. The overall dynamic of the Ecophyto plans is summarized in Fig. 1. For easier reading, table 3 presents a summary of the main instruments contained in the successive plans.

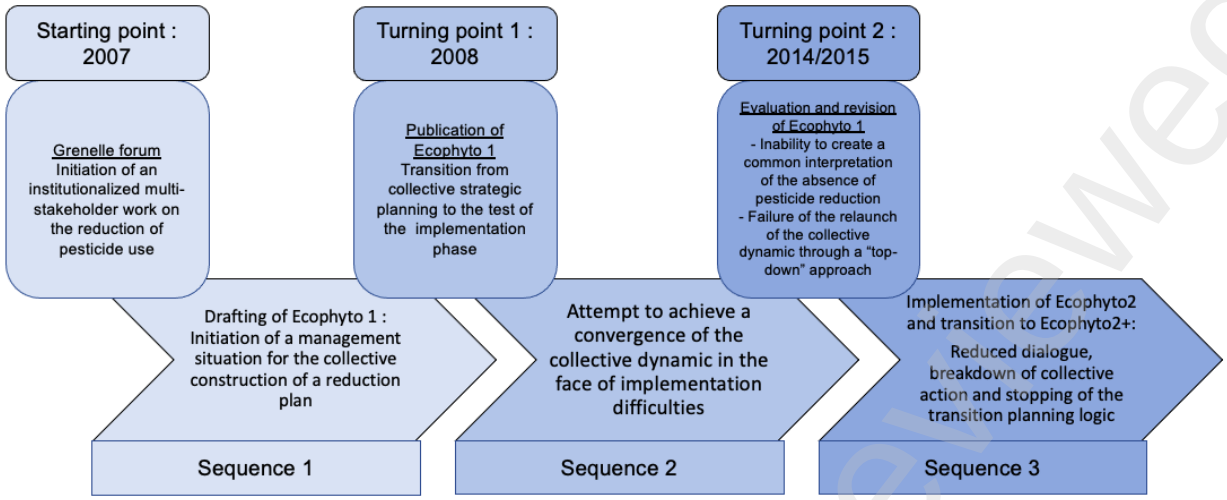

Fig. 1: Narrative diagram of the evolution of the management situation for the transition toward pesticide reduction

4.1. Analepsis: Increased focus on reducing overall pesticide use

Since the 1980s, the use of pesticides has faced increasing criticism for its environmental and health impacts, gradually leading to important controversies (Pellissier, 2021). In order to contribute to the debate, in 2005, the National Institute for Agronomic Research (Institut National de la Recherche Agronomique or INRA) produced a report on the impacts of pesticides (Aubertot et al., 2005), which defended the need and the technical feasibility to reduce the overall use of phytosanitary products. Far from ending the controversies, the publication of the report highlighted the differences of opinion between actors. On the one hand, professional agricultural organizations – technical institutes, majority unions, main advisory agent, cooperatives and industry representatives – opposed any significant reduction target and criticized the methods used in the study. On the other hand, environmental NGOs and actors in the Organic Agriculture sector, supported by several INRA researchers. Although these two groups were not completely homogeneous, this disagreement regarding the feasibility and desirability of an objective of global reduction of the use of pesticides constituted a dividing line which would be maintained over time.

In an attempt to strengthen the arguments in favor of reducing pesticides, ministries commissioned a new report from the INRA in 2007, entitled "Ecophyto R&D" (Butault et al., 2010), with the objective of identifying the techniques available to enable farmers to ambitiously reduce the use of pesticides.

4.2. Starting point – The Grenelle Environment Forum: Initiation an institutionalized multi-stakeholder work on the reduction of pesticide use

In 2007, following pressure from civil society, the newly elected President, Nicolas Sarkozy, organized the Grenelle Environment Forum – a broad consultation process on environmental

issues (Boy et al., 2012). This culminated in setting an objective of "*reducing the use of pesticides by 50% over 10 years, if possible*". A 50% reduction was seen by the NGOs and INRA researchers as the approximate level where it becomes necessary to radically redesign farming systems, in a way that would also allow to meet other sustainability goals. The wording *"if possible*" was added following pressure from agricultural organizations (Guichard et al., 2017).

4.3. Sequence 1 – The drafting of Ecophyto 1: Initiation of a management situation for the collective construction of a reduction plan

4.3.1. A positive multi-actor dynamic in search of consensus

It was therefore in a context of actor division that the administrative departments of the Ministry of Agriculture had to ensure the drafting of a plan for the operationalization of the Grenelle Forum's objective. Anxious to preserve the multi-actor dynamic resulting from the Grenelle Forum, the Minister of Agriculture, Michel Barnier, launched an operational committee, called the "Paillotin Operational committee" after its chairman, which brought together all the stakeholders to collectively develop the national plan. The actors actively engaged in the Operational committee tasks, which was seen as a constructive place to work despite fundamental disagreements (table 4, verbatim 1)

4.3.2. The attempt to create compatible interpretations through science and expertise

The departments of the Ministry of Agriculture organized working groups in such a way as to facilitate an exploration of the possible existing options. Researchers and experts were asked to present the state of the science. The orientations of the "Ecophyto R&D" study were adapted to shed light on the "possibility" and the conditions of achieving the Grenelle Forum's objective, and thus legitimize it (Aulagnier, 2021). However, this mode of exploration failed to convince the agricultural world, which did not accept the results of Ecophyto R&D (Butault et al., 2010). In their eyes, the report did not sufficiently detail the concrete implications of the objective of 50% reduction over 10 years for each link of the agri-food systems.

4.3.3. A constrained and weakly generative process of translation of the objective into actions

The collective was not totally free in their choice of how to translate this exploration into concrete actions. As early as November 2007, when the Paillotin Operational committee's work had not yet started, the Minister of Agriculture had already mentioned the centrality of 3 instruments: research and development, training for farmers, and strengthening the bio-aggressor surveillance networks (Aulagnier, 2021), hereby reusing old ideas of public action (table 4, verbatim 2). Within this limited universe, the stakeholders proposed ideas coming out of the working groups, or from work and ideas that emerged within their respective structures. The plan proposed by the Paillotin Operational committee detailed and expanded on the elements proposed by the Minister and added a few aspects to it, such as the creation of monitoring indicators or a communication component.

One of the main instruments, the Plant Health Bulletin, a bulletin alerting farmers to phytosanitary pressure in their regions (table 3) was a recycling of agricultural warnings, an instrument that pre-existed the plan. The Bulletin was not designed for the Ecophyto plan, which in fact constituted a funding opportunity for it (Guichard et al., 2017; Aulagnier, 2021; Interviews).

The DEPHY network of innovative farms (table 3) constitutes an exception in the way it was designed and is therefore considered by many actors to be the major innovation of the Ecophyto plan (Barbier, 2017). The DEPHY network was the result of a long design process by the INRA researchers, commissioned by the Ministry of Agriculture (Butault et al. 2010). Nevertheless, the temporal objective (achieving a 50% reduction over 10 years) was not sufficiently taken into account into the design process : the designers of DEPHY tried to develop an instrument that could support pesticide reduction, without assessing the time it would take to reach its goal and adapting the instrument with this temporal constraint in mind (table 4, verbatim 3).

4.3.4. A consensual plan, but weakly binding and not systemic

The instruments proposed by the Paillotin Operational committee mainly targeted farmers and their advisers (Guichard et al., 2017). They did not take into account the effects of their practices' interdependence with other links in the sociotechnical system, such as cooperatives, agro-industries or even consumers (table 3).

Despite the extensive divisions within the group, the plan was validated by all the actors. Indeed, the very numerous proposals seemed to go in the right direction for the NGOs (table 4, verbatim 4). The proposals were mostly non-binding, and some represented significant funding opportunities for agricultural organizations, encouraging them to stay in the discussion (Aulagnier, 2021). Thus, the actors managed to agree on proposals for strategic actions without agreeing on the final targeted results.

Main instruments	Description	Method of delegation
Ecophyto 1		
DEPHY farm network	Network of pilot farms accompanied by a technical adviser, with the aim of reducing the use of pesticides and developing new technical references	- Strategic steering committee made up of representatives of the actors involved in Ecophyto - Operational steering committee hosted mainly within a public organization representing and advising farmers (Chambers of

		Agriculture France)
‘’Certiphytos’’ phytosanitary certificates	Training allowing the obtaining of an individual certificate, compulsory for all professionals using, advising or marketing pesticides	- The training courses were delivered by competing private organizations. Programs were defined by regulation, and could be controlled by the administration (Ansaloni, 2017)
Plant Health Bulletin	Free information bulletin on phytosanitary pressure around a crop in a given region, based on a network of observations, and aimed at avoiding phytosanitary treatments not justified by the presence of pests.	- Creation of a regional committee for epidemio-surveillance, chaired by the president of the regional chamber of agriculture and bringing together agricultural organizations and the State administration - The regional State administration verified that the decisions taken were in conformity with those taken at the national level. - The data was collected and analyzed by various agricultural organizations (Aulagnier, 2021)
Fee for Diffuse Pollution	Levy on the sale of pesticides used to finance the actions of the Ecophyto plans	- Levies were taken by the agency in charge of biodiversity and managed via the Water Agencies. - The allocation of funding within the Ecophyto plans was validated by the stakeholders, grouped within the Advisory Governance Committee - which would be abolished in 2016
Ecophyto 2 (additions compared to Ecophyto 1)		

Pesticide Saving Certificates	Certificates aimed at obligating distributors of pesticides to promote the implementation, on farms, of actions recognized as enabling the reduced use of pesticides. Each practice is linked to a quantified level of product savings, and distributors must achieve a certain level of savings defined at the national level. The financial penalty originally provided for was subsequently removed.	- The recognized actions were defined by a committee of technical experts led by the National Institute of Agronomic Research, on the basis of proposals that could come from the actors - The distributor obligation levels were defined by agents from the Ministry of Agriculture (Aulagnier, 2021)
Ecophyto 2+ (additions compared to Ecophyto 2)		
Advising/sales separation	Prohibition for organizations providing advisory services to farmers from selling pesticides, and vice versa	N/A

Table 3: Main instruments of Ecophyto 1, 2 and 2+ plans and their terms of delegation (excluding substance prohibition) These instruments were deemed to be central to the Ecophyto plans on the basis of (i) the extent of their financing relative to the total financing of the plans or (ii) the importance given by the actors during the interviews or within the gray literature

4.4. Turning Point 1 - Publication of the Ecophyto 1 plan: The implementation test

The Ecophyto 1 plan was published in 2008 and largely incorporated the Paillotin Operational committee proposals. The first years were dedicated to operational implementation of the plan.

4.5. Sequence 2 - Search for consensus in the face of implementation difficulties

4.5.1. Lack of emergence of compatible interpretations

The ministry set up numerous working groups to monitor the plan components and discuss the points of disagreement that persisted, in particular on the most controversial aspects: the possibility and desirability of reducing the use of products, and the definition of appropriate monitoring indicators (Aulagnier, 2021). These working groups were appreciated by the various actors for their ability to provide spaces for discussion and mutual acquaintance for people who did not normally work together (agricultural and environmental actors in particular) (table 4, verbatim 5). However, little by little, the limits of collective action started appearing. Despite the density of the discussion arenas, the actors failed to find common ground. The slowness of this process weakened certain actors' confidence in collective action (table 4, verbatim 6)

366 4.5.2 Implementation fragmentation
367
368 Moreover, the richness of the discussion spaces also made them difficult to follow. Certain
369 actors, especially NGOs, lacked the resources to be present in all of the working groups.
370 Indeed, the "Ecophyto system" gradually became more and more complex. The Ministry of
371 Agriculture, due to insufficient dedicated human resources and a desire to involve stakeholders,
372 delegated a large part of the implementation to different actors (table 3). For each important
373 instrument, groups of varying composition made operational decisions impacting the functioning
374 of the instruments themselves. Full monitoring of implementation was almost impossible (table
375 4, verbatim 7). Therefore, the fragmented aspect of the plans was reinforced. There were few
376 links between the different instrument management groups, which could then evolve over the
377 course of the discussions without necessarily seeking convergence with the others (table 4,
378 verbatim 8).
379
380 Moreover, these delegations had another effect: the ministries sought to use this mode of
381 operation to enlist the actors from the dominant system in the dynamics, and facilitate their
382 adhesion (table 4, verbatim 9). In France, agricultural organizations have an important influence
383 and agricultural policies have historically been carried out on a "co-management" model
384 (Aulagnier, 2021). This structuring allowed the delegated actors to acquire a certain power over
385 the shaping of the instruments for which they were responsible. They were thus sometimes able
386 to attenuate the objectives set out in the plan. Ansaloni (2017) shows, for example, that the
387 private actors in charge of training sometimes redefined the content of Certiphyto phytosanitary
388 certificates (table 3) to avoid presenting alternative techniques to pesticides.
389
390 4.5.3. The impossibility of creating compatible interpretations for the lack of reduced pesticide
391 use
392
393 As the implementation of the actions started, which sometimes took several years, it became
394 apparent that the 50% reduction goal would not be achieved as rapidly as had been hoped. The
395 expected reductions failed to materialize (Fig. 2).
396
397 The explanations for this absence of reduction differed among the participants. The
398 environmental actors saw it as a lack of will on the part of the agricultural profession and a proof
399 of the need to take more drastic actions. The agricultural organizations saw in it the illustration
400 that they were expecting that the objectives set were unattainable and should be modified. The
401 latter also defended the significant efforts made by farmers, and believed that the plan's
402 indicators did not give a realistic view of the changes under way. Indeed, there were no
403 indicators or processes developed to create adequate knowledge allowing actors to explain the
404 evolution in the use of pesticides (table 4, verbatim 10). This lack of compatible interpretation
405 had the effect of reinforcing the existing divisions within the collective.
406

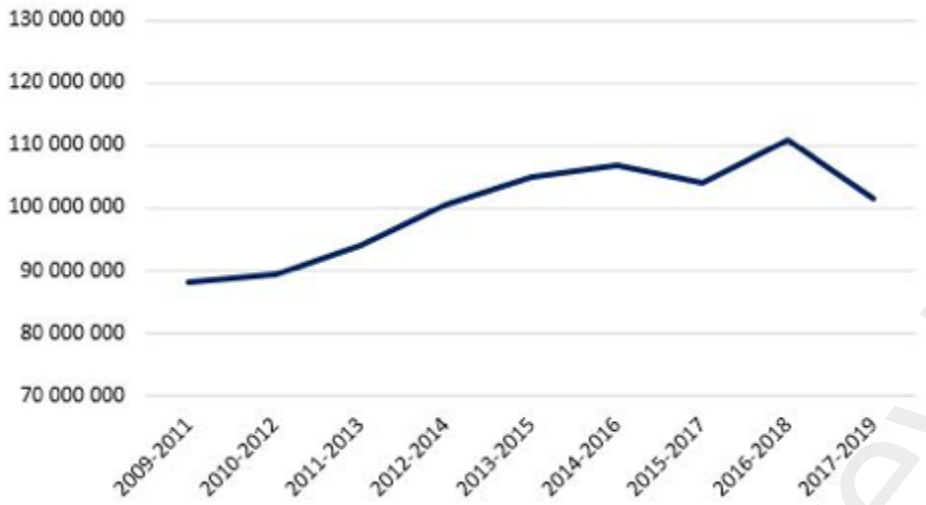

Fig. 2: Evolution of pesticide use in the agriculture sector in France (NODU in ha - three-year average). Source: French Ministry of Agriculture and Food, 2021

NODU is the indicator created to monitor the Ecophyto plans. It is calculated from sales data of pesticide distributors and shows the evolution of the average number of annual applications. It corresponds to the surface that would be treated yearly with pesticides at the maximum approved doses.

4.5.4. Relaunch of the inquiry process through the mobilization of expertise

The dynamic around Ecophyto then continued to deteriorate little by little, but the actors remained involved. In 2012, following the election of President François Hollande, a new minister, Stéphane Le Foll, took over as head of the Ministry of Agriculture. He claimed to want to "*launch a new phase*" (Ministry of Agriculture, Food and Forestry, 2012) and started a new exploratory dynamic to identify new possible policy instruments. This dynamic was based on the commissioning of several reports, in particular on agricultural extension, taxation or Pesticide Saving Certificates (table 3).

4.6. Turning Point 2 - Evaluation and revision of the Ecophyto 1 plan: Failure to relaunch momentum through "top-down" management

4.6.1. An inquiry process far from stakeholders

In 2014, an overall evaluation of the Ecophyto 1 plan was launched. To give it political weight, the administration asked a deputy to take charge of the work. Rather than conduct a collective dialogue like in the first Ecophyto working groups, the deputy consulted with all the stakeholders separately, conducted field visits and consulted the expert reports previously commissioned. He also assumed the political dimension of his work (table 4, verbatim 11).

Based on this work, he wrote a report with several recommendations (Potier, 2014). This report would serve as a basis for officials from the Ministries of Agriculture and the Environment, who

joined the management of the plan, to revise the first plan and draft an initial version of the Ecophyto 2 plan. Nevertheless, the departments of the ministries were constrained by the financing already committed for Ecophyto 1. It seemed difficult to stop financing the positions and major actions of the first plan (table 4, verbatim 12).They then consulted the stakeholders again.

We witness here a shift in the design process of the new Ecophyto 2 plan. The ministries adopted a more "top-down" approach of consultation and drafting within the administrations. The inquiry process was no longer entirely carried out by the actors in the management situation, but was taken over by the administration.

4.6.2. A marginal modification of the plan

In terms of policy instruments, the deputy concluded that the first plan had failed. Nevertheless he proposed to maintain its main instruments while strengthening certain targeted aspects (Potier, 2014):

- Reinforce the consideration of human health protection aspects (protection of users, local residents, consumers…);
- Act at the Common Agricultural Policy (CAP) level to ensure that it supports Ecophyto objectives;
- Better take into account sectoral and territorial specificities within the plan;
- Reinforce constraints on actors of the value chain others than farmers. To this end, he supported a proposal initially coming from an INRA report (Guillou et al., 2013): the Pesticide Saving Certificates (table 3). Those initially aimed to financially compel the distributors of pesticides to support alternative solutions;
- Increase significantly the taxation of pesticides.

These proposals highlight two notable dynamics. First, a desire to display greater political voluntarism by mobilizing instruments that are both symbolic and economically structuring (taxation and CAP), and activating binding instruments (Product Savings Certificates). Secondly, the greater consideration given to human health protection aspects shows a desire to broaden the plan, despite the criticisms made that it was already excessively large and weakly prioritized. One can see this as a loss of sight of the initial objective of the plan : the redesign of cropping systems was initially seen as the direct technical translation of the 50% reduction objective. In this report, it became one lever among others. Indeed, it emerged from our interviews that several actors, especially certain administrative agents or members of professional agricultural organizations, had analyzed Ecophyto 1 as a failure of the vision of change through the profound redesign of cropping systems. This gave more weight to their vision of a need for an incremental transformation based on risk reduction and improved product use efficiency, without radical change in practices.

Most of the recommendations in the report were taken up by the ministries, with the exception of the most divisive points, the CAP and taxation, and this despite the strong expectations of "alternative actors" on those two points.

4.6.3. A failure to relaunch the collective dynamic

These choices, as well as the top-down procedure implemented, prevented relaunching the collective dynamic. Although the actors saluted the work of the deputy and the balance in consulting the various stakeholders, it did not make it possible to draw a shared interpretation of the sources of the failure, nor to identify consensus-generating ways to move forward. Moreover, his report constituted an ambiguous conclusion that satisfied no one. Indeed, the "alternative" actors were in search of in-depth transformations of the plans faced with the acknowledgment of failure, actions on the CAP and relaunch of ambition. The actors of the dominant system were still opposed to the objective of reduction and put off by the introduction of financial constraints through the Pesticide Saving Certificates.

The attempt to establish Pesticide Saving Certificates also reflected a desire to extend the targets of public action to actors other than farmers and their advisers, in order to establish a broader movement within the sociotechnical system. Nonetheless, this argument was still not pushed as far as it could have gone. By being limited to cooperatives, many actors of the system and components of the lock-in were still not taken into account – whether upstream or downstream, such as the processing industries or consumers for example.

4.7. Sequence 3 - Implementation of Ecophyto 2 and transition to Ecophyto 2+: breakdown of collective action

4.7.1. A change in governance that confirmed the deterioration of the collective dynamic

The dynamic was further weakened by the elimination of several bodies of governance, which the administrations considered to be ineffective. This was the case, for example, of the steering committees of each axis of the plan, or of the governance advisory committee, whose purpose was to have Ecophyto expenses collectively approved. This transformation was experienced as a reduction in transparency by all the participants and a deterioration in the collective work (table 4, verbatim 13 and 14).

In 2019, the government published a new version of the plan, the Ecophyto2+ plan. Administrative management was further extended by integrating the Ministries in charge of health and research, which, for the stakeholders, further burdened the organization of meetings and degraded governance by increasing the number of actors and ministers to coordinate.

4.7.2. A change in the use of Ecophyto spaces

Little by little, the action of the collective was transformed by the simultaneous reduction of workspaces and the increase in the usage of binding instruments. While Ecophyto meetings were not neglected, they were no longer considered spaces for dialogue. Some agricultural organizations stepped up their action to oppose attempts at coercion. For example, they asked the Council of State, the French supreme court for administrative justice, to cancel the Pesticide Saving Certificates in 2015 (petitions nos. 394696 and 395225 of December 28, 2016 to the

Council of State). In an almost symmetrical mechanism, in 2018, NGOs did the same for decisions deemed too unambitious on the creation of non-treatment zones near homes (Council of State, 2019). The importance of bilateral meetings between stakeholders and the administration was reinforced (table 4, verbatim 15). After the election of President Macron in 2017, the movement away from Ecophyto working groups was reinforced. The executive branch made numerous important decisions, such as the ban on glyphosate, a decision made in 2017 by the President (Macron, 2017), or the ban for companies to offer both the sale of pesticides and advisory services on plant protection strategies, which constituted an election promise.

The Ecophyto2+ plan mainly aimed at integrating decisions that were not formally included in the Ecophyto dynamic. More than a place of strategic thinking and planning, "Ecophyto" became a tool for gathering actions taken on pesticides independently from one another, and kept losing legitimacy.

4.8. Epilogue: Blocking and abandonment of collective transition management

This led to a situation where collective action was blocked. Even though the Ecophyto plans and the societal dynamics since 2007 made it possible for the discussions to progress, and only a few actors were now opposed to the idea of a need to reduce the use of pesticides, the gap between positions had widened. Agricultural organizations sought to build an image of actors driving a "pragmatic" transition. However, they were still opposed to a significant reduction objective, in-depth modification of cultivation systems, or the use of binding public action instruments. Environmental NGOs were becoming more radical and tending more and more towards demands for a pure and simple ban on the use of pesticides (table 4, verbatim 16):

The use of these products has still not reduced significantly (Fig. 2).

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	Illustrative verbatim	Type of actor
1	“I remember that it was […] a very positive and very mobilizing way of working that was trying to attract people no matter what. [...] no one had left, no one had slammed the door.”	Representative from an environmental NGO
2	“to make an action plan to reduce the use of pesticides, [...] there will be a training component, a research component, and a monitoring or experimentation component […] it's not completely revolutionary either, it's something that comes to mind quite quickly. [...] in all the plans that I know of, [...] there is always a training component and a research component.”	Policy-maker from the Ministry of Agriculture
3	“Are we going to be able to get there in ten years, is that enough, shouldn't we act somewhere else? We didn't discuss all that in part 2 [of the Ecophyto R&D report, which proposed a structuring of the DEPHY instrument].”	Researcher who participated in the writing of the Ecophyto R&D report
4	“And we discussed a lot of things, point-by-point where everyone gave their opinion […], so that interesting things and ideas on what to work on came out of it. […] there were really only a few things in the end on which we did not agree at all.	Representative of an environmental NGO
5	“At the beginning of Ecophyto […] I saw the meetings, the rooms full of people to discuss the allocation of funding. So there was truly a discussion with the stakeholders. In their diversity, which is normal. […] I spoke a lot at the time with [an environmental NGO] and other actors...”	Representative of an agricultural union
6	“[The objective of agricultural organizations opposed to the 50% reduction objective] is always to try to demonstrate that doing without chemical compounds is not possible today […] But although it is acceptable at the very beginning of the process, it is less so [after 13 years]”	Representative of an environmental NGO
7	“The system was absurdly complex. There were a lot of groups that were created as a result for implementing the Ecophyto plan. We were a small team, so we couldn't be everywhere.”	Representative of an environmental NGO
8	“In fact, that was really the teaching of Ecophyto 1, an operation without any transversality in fact: each component led its own life, and there were meetings of deputy directors once or twice a year to say what they had done in each axis of the plan.”	Policy-maker from the Ministry of the Environment
9	“The option [taken] was to say: we are going to ask the agricultural world to take charge and get themselves moving. […] And so it was - finance the chambers of agriculture so that the chambers of agriculture would carry the Ecophyto policy.”	Policy-maker from the Ministry of the Environment

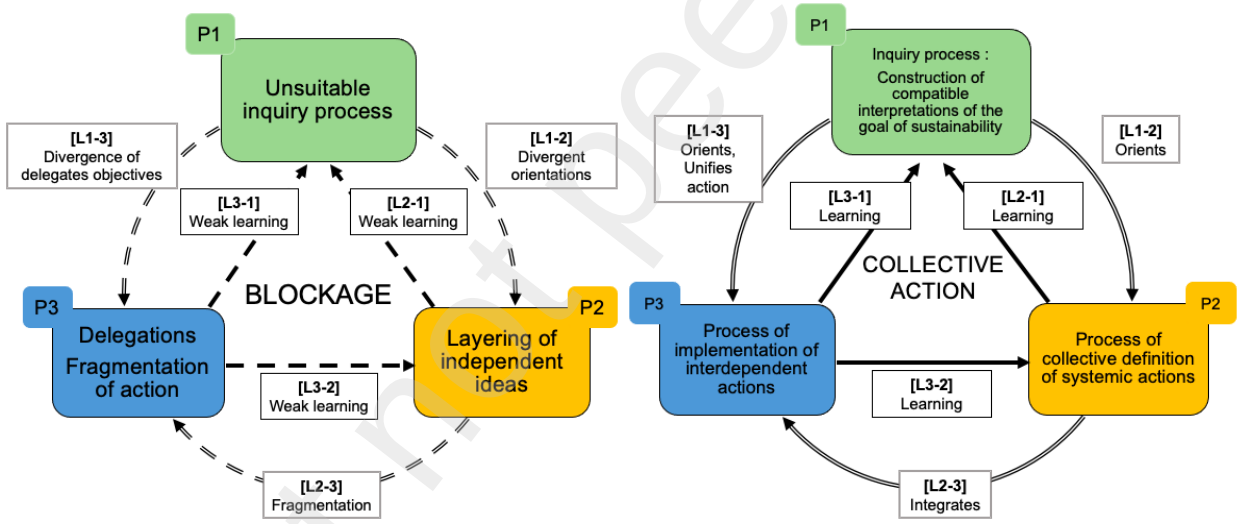
10	“The agricultural profession really had changed its practices in terms of the use of phyto products in recent years. And it did not understand that just that could not affect the [plan indicator]. And in terms of the explanations that the Ministry of Agriculture could provide, it was a bit of a disappearing act, because we didn't really have an explanation for the increase [in the indicator].”	Employee of an organization representing agricultural businesses
11	“What must be remembered is that politics takes control of the report, and of the methodology. [...] Should we go see the ladybug manufacturers, or rather a potato field in Pas-de-Calais region [...] there is a political dimension [...] We have not been in the most resistant regions, but instead we have been to see pioneers [...]”	Deputy in charge of evaluation
12	“We were very constrained by the fact that we were structurally financing a number of positions, and that Ecophyto 2 was neither an opportunity nor an excuse to eliminate positions that were financed via the regional chamber of agriculture, for example. Since we would lose the support of the [national assembly of chambers of agriculture] for the plan.”	Policy-maker from the Ministry of Agriculture
13	“We no longer had the impression of being involved. We were consulted, of course, we were continually consulted. But there was no longer any impression of working together, of working with the other actors”	Representative of an environmental NGO
14	“We had moved a long way from an enrichment of public policy by the stakeholders. […].the absence of discussion meetings also meant that we could drift apart in terms of points of view […]. So it was gradually the administration alone that made its choices...”	Employee of an agricultural union
15	“Everything happens in bilateral exchange, [...] there is no longer a common space where we can discuss this all together [...] if I compare the part of my position that is to support elected officials on these subjects, before I accompanied them a lot more at collective meetings than at bilateral ones.”	Employee of an organization representing agricultural companies
16	“After ten years, we haven't seen the results of the Ecophyto plan, so… [...] the position is no longer -50, it's zero phyto: we have to go toward the complete cessation of using pesticides. […] the positioning is radicalized completely”	Representative of an environmental NGO

548 Table 4 : Illustrative verbatim from interviewed stakeholders

5. Findings and discussion

5.1. How to explain the failure of the State's management of the transition policy process?

The analysis of Ecophyto's history reveals that three types of interdependent processes disrupted the collective development and implementation of the transition policy (Fig. 3-A):
1) The processes of inquiry, which did not allow collective sensemaking and the construction of compatible interpretations of the goal of sustainability ([P1]);
2) The processes of collective definition of actions, which did not take into account the lock-in and the systemic dimension of a transition ([P2]);
3) The action implementation processes, fragmented and poorly interconnected, which hampered the possibilities of mutual adaptation between instruments ([P3]);



3-A : Central pillars of collective action in Ecophyto

3-B : Central pillars of collective action for transitions

Fig. 3: Central pillars of collective action in Ecophyto (left) compared to collective action for transitions (right)
[Left] Diagram A - describes the blocking elements for each of the pillars of collective action in the Ecophyto processes (P1, P2 and P3) and their interconnections (L).
[Right]: Diagram B - describes the central pillars of collective action for transitions.
The arrows representing the links (L) are numbered to match the numbers of the pillars to which they are connected (e.g : L3-2 connects pillar P3 to P2).

5.1.1. An unsuitable inquiry process ([P1])

5.1.1.1. Insufficient attention to constructing compatible interpretations

In Ecophyto, the inquiry process operated two main levers: collective discussion within the working groups, to which researchers and experts were invited, and expert support through the production of reports. These levers did not allow the creation of compatible interpretations of the situation between participants. Two specific features of the inquiry process explain this: (i) The main tool for exploring the implications of the objective set was the technical-economic modeling of the Ecophyto R&D report (Butault et al., 2010), which induced a form of technicization of the debates. More political questions (Under what conditions is it desirable to reduce pesticides? For whom? etc.) were not made sufficiently explicit and debated. (ii) While there were discussions on the most appropriate monitoring indicators, there was no exploration of tools for analyzing the *causes* of the persistence of pesticide use that could have contributed to the construction of compatible interpretations of the situation (see section 4.5.3.). The differences of interpretation on the developments under way in the agricultural world therefore persisted. It was difficult to consolidate lessons learned from implementation, which limited feedback and potential learning (Fig. 3-A L3-1). Even though the State tried to create a collective interpretation within the group, its problem was rather a difficulty in identifying appropriate tools and processes for sensemaking: it confined itself to its usual practices of mobilizing science and expertise.

5.1.1.2. Lack of exploration at the sociotechnical system level

Failure to explore the implications of the goal of sustainability, coupled with an absence of consideration of the systemic aspect of the transition, limited the collective's ability to redefine the problem in the inquiry process. The notion of lock-in was present from the beginning of Ecophyto: it was presented in the Ecophyto R&D report (Butault et al., Volume VII, p. 38). Nevertheless, the 1st plan favored the "cropping system" concept, relatively isolated from the sociotechnical system into which it was integrated. This lack can be explained in two ways. First of all, it appears that the "forgotten" links of the system were mainly those presenting the strongest political stakes (the CAP) or concentrating the most power (agro-industries). But it is also possible that the idea of systemic transition had not yet gained enough importance in collective discussions to take a central place in the construction of meaning.

5.1.1.3. Gradual abandonment of spaces for dialogue

Faced with the difficulties of the 1st plan, the ministries gradually turned to "top-down" management (see sections 4.6. and 4.7.). To define the actions of the 2nd plan, they favored consultation over co-construction, while seeking to increase the constraint on the agricultural actors, without success. This top-down management did not make the actors' claims disappear, but rather led them to use other arenas: bilateral discussions with people at high hierarchical levels within the ministries, or recourses to legal authorities such as the Council of State. This resulted in blockage of the management situation. This shift was perceived negatively by the participants, who all regretted the disappearance of the possibilities of direct dialogue. Thus, by wanting to stop the collective construction process, the State did not manage to achieve its objective, but prevented the sharing and learning that could have nourished the construction of compatible interpretations and relaunched a dynamic (Fig. 3-A – L2-1 and L3-1).

5.1.2. From the inquiry to the definition of actions: layering of independent ideas and lack of creativity ([P2])

The actions to be undertaken were determined in several ways: recycling and adaptation of already existing instruments or public action logic, group discussions between stakeholders, expert reports or proposals from working groups, stakeholders' consultation. Within these processes, the definition of actions adapted to the objectives collided against two elements: (i) the weakness of the inquiry process and (ii) the absence of a creative process.

5.1.2.1. Loose link between objective and actions

In the absence of a collective interpretation and re-problematization of the objective with a system perspective, the actors proposed actions relatively independently, leading to a form of layering of ideas. This process led to proposals relatively disconnected from the objective (Fig. 3-A - L1-2):

- The instruments were not really defined according to the expected results of the management situation. Similar instruments could have been proposed if the objectives consisted in lower reduction targets or aimed at a reduction over a longer periods of time (see sections 4.3.3 and 4.6.1.);
- Some instruments had no direct link with the reduction of pesticides, such as actions aimed at protecting the health of users (see section 4.6.2.)
- The instruments did not make it possible to mobilize the various reduction levers at different levels of the sociotechnical system. The 1st plan was mainly focused on farmers and their advisers (Guichard et al, 2017). The 2nd plan tried to open up the targets of public action but limited itself to integrating distributors and not the other actors of the sociotechnical system (see sections 4.3.4. and 4.6.3.).

5.1.2.2. Absence of creative process and recycling of old arguments

According to the data collected, the processes described did not make it possible to get out of pre-constructed ideas or explore new approaches. The framework given for Ecophyto 1 by the Minister of Agriculture was explicitly based on old public action logic without having verified that it was still suited to the problem. Some instruments corresponded to recycled pre-existing instruments, such as the Plant Health Bulletin (see section 4.3.3.).

5.1.3. Delegation of implementation and division of action ([P3])

Implementation was delegated to collectives of actors, which led, as we have seen (see section 4.5.2.), to a fragmentation of the action and left to certain actors in charge of delegations the possibility to redirect or attenuate the content of certain instruments. In Ecophyto, using delegations as an enrollment tool constituted a significant risk because the delegates had divergent objectives (Fig. 3-A L1-3). Even if the delegations created a link of accountability between the delegates and the ministries (through contractual obligations, decrees, etc.), this

accountability concerned the implementation of the instruments, and not the achievement of the plan's objective. Since each instrument was not intended on its own to allow the 50% reduction, it was difficult to judge the success of the delegations, and therefore, for the ministries to guide with finesse the action of the delegates.

In addition, the development of Ecophyto plans from a layering of proposals, coupled with a compartmentalized governance system, led to a fragmentation of implementation (Fig. 3-A L2-3). As we said in section 4.5.2., there were few links between the management groups of the different instruments, preventing any overall perspective. In turn, this limited the contribution of the implementation phase to the construction of compatible interpretations of the situation. Indeed, each stakeholder had a good understanding of only one part of the public policy and very few individuals had access to a global vision (Fig. 3-A L3-1).

5.1.4. Disconnection of the three pillars and weak learning

Finally, the narration shows the weakness of the links between the three pillars and that the learning processes were not sufficiently integrated into management of the collective action. The inquiry process did not make it possible to orient the definition of actions (Fig. 3-A L1-2) and to guide the implementation (L1-3). The tools for obtaining feedback from the action mainly took the form of indicators and evaluation reports. They were therefore primarily based on a contribution of expertise where the conclusions were constructed outside the collective, which did not make it possible to build a shared understanding (L3-1 ; L3-2). The gradual disappearance of spaces for dialogue, coupled with the multiplicity of working groups and the fragmentation of the implementation, did not enable the collective to reap lessons from the definition of actions (L2-1) and their implementation (L3-1 ; L3-2).

5.2. Cross-sectional discussion

Within the Sustainability Transitions literature, several approaches provide a critical analysis of policy processes. Most adopt a governance perspective, analyzing policy processes through the lens of the dynamic relationships between actors, power plays and their influence on decision-making (Stegmaier et al., 2014 ; Stegmaier et al., 2021; Levain et al., 2015; Hoffmann et al., 2017; etc.). By adopting a pragmatist management perspective, we shed light on the concrete interplay between the actors' visions, ideas and positions and the operational management processes. It allows us to show that the plan's failure was already scripted in Ecophyto's elaboration process itself.

Based on our results, we built a framework for analyzing transitions policy processes and guiding policy-makers in their definition, presented Fig. 3-B. We defined three central pillars for the management of collective policy processes and its adaptation to the specificities of sustainability transitions. This framework was built to allow for the correction of the shortcomings synthetized in Fig. 3-A. To specify the characteristics of the pillars, we reflected on our results in the light of the TM framework (Rotmans et al., 2001; Loorbach et al. 2008; Loorbach, 2010 ; Loorbach and Rotmans, 2010; Loorbach et al., 2015) :

- **Supporting an inquiry process allowing the construction of compatible interpretations of the goal of sustainability** (Fig. 3-B – P1): By using the management situation concept, we show the importance of equipping the creation of compatible interpretations through the process of inquiry. Loorbach (like many others; e.g.: Geels and Schot, 2007), also emphasizes the importance of creating a compatible interpretation of the problem for the actors involved. Nonetheless, Loorbach's framework does not seek to specify the principles or tools needed to succeed. By highlighting the fact that the ministries tried, in Ecophyto, to mobilize science and expertise to support collective sensemaking, without success, our analysis shows that public actors did not fail because they did not try to create compatible interpretations, but because they did not know how to concretely do so and did not have the appropriate tools to build compatible interpretations of the goal of sustainability. It would therefore be appropriate to concentrate research efforts on those tools, building on the rich existing literature (e.g. Matti and de Vicente, 2016; Turnheim and Nykvist, 2019; Barrios et al., 2020, etc.), and reflecting on their adaptation to the issues noted in this paper.
- **Equipping the process of collective definition of systemic actions** (Fig. 3-B – P2): Loorbach (2010) believes that one of the conditions for selecting actors to participate in a Transition Management process lies in their ability to translate a transition vision into concrete actions, as if it were a personal skill. Nonetheless, institutionalized policy process can rarely select participants based on their personal abilities. In addition, we show that this translation process is a central element of the management of transitions that is not self-evident. Despite the diversity of the actors mobilized in the Ecophyto, their proposals did not really make it possible to escape old action logics or to innovate. Thus, it seems crucial to us to define operational tools and processes of collective definition of systemic actions. These processes need to help actors so that this translation can be done in an appropriate way. Indeed, unlike many innovation actors, public authorities do not always have specific co-design tools, and are poorly equipped for systemic thinking. These tools should make it possible to reap the knowledge provided by the variety of stakeholders involved. They should also allow actor to collectively build the structure of the implementation methods as an integral element of the design process (L2-3).
- **Designing a process of implementation adapted to the interdependency of the actions** (Fig. 3-B - P 3) : Our pragmatist perspective allowed us to consider the implementation phase as a constitutive part of the policy process. We showed that the implementation systems need to be designed in a way that limits the ability of dominant actors to transform the instruments and ensures interconnections between interdependent actions to facilitate co-evolution and learning. While Loorbach (2010) takes a more global approach that does not question those micro-level operations, we highlight that this phase is a crucial step that should not be overlooked by policy-makers.
- **The three pillars need to be interlinked** so that the inquiry process orients actions definition (L1-2) and implementation (L1-3), and that those can feed the collective learning process and improve collective sensemaking (L2-1; L3-2; L3-1).

By highlighting the specific needs of institutionalized policy processes, these elements show the

complementarity of our work to the TM framework, which was built as a mode of governance of informal networks, only indirectly influencing public policy processes (Loorbach, 2010; Wittmayer et al., 2018).

Finally, these elements highlight another contribution, which is of a methodological nature. The mobilization of a dynamic and procedural approach via the management situation concept has proved to be particularly fruitful. It has enabled us to develop an analytical framework highlighting key elements needed to ensure collective action is *manageable,* even in the presence of strong uncertainties (Girin, 2011). While this concept has been used to study the management of environmental issues (Barbier et al., 2020), to our knowledge this is the first article using this concept to study state-level policy processes. The combination of the management situation framework with the framework of sociotechnical system transitions proved to be particularly interesting. Indeed, it allowed us to insist on the need for collective action and to reflect on the tools needed to equip it in order to explore the systemic aspect of transitions. Above all, it highlighted the usefulness to question the very definition of *management* in order to support policy-making for transitions.

Despite these contributions, our research has some limitations. Our analysis is based on a single case study. The relevance of the deployed framework to manage systemic transitions will have to be verified by analyzing other public policies – whether agricultural or not – to ensure its genericity and to validate, amend or enrich the conclusions. Testing our analytical framework in a diversity of contrasting cases would reinforce the validity of our contributions.

It will also be necessary to test its usefulness for the development of transition policies, supplementing it by mobilizing or defining concrete tools for each of the recommendations. We thus believe that our research makes it possible to point to a promising research-action perspective for the State's management of sustainability transitions, which would focus on the development and experimentation of new concrete methods for co-designing systemic public policies.

6. Conclusion

Proposing tools and frameworks for managing the transitions of sociotechnical systems for public policies is a subject of growing interest. This approach is particularly relevant for the question of reducing pesticides, as agri-food systems present strong lock-in around this technology. This article has sought to contribute to this field of research, starting from the analysis of French public policies. We looked at the question of what had limited the State's capacity to organize collective action to develop public policies adapted to the reduction of pesticides.

Our results make it possible to formalize a framework for analyzing public policy construction processes for systemic transitions, considering them as a situation to be *managed*. We highlight the importance of the three interconnected processes: the process of inquiry, to create compatible interpretations of the goal of sustainability; the processes of collective definition of

systemic actions; and the processes of implementation of interdependent actions. In our case-study, processes to create compatible interpretations were not absent, but were ill-adapted to the diversity of actors and their issues. They did not allow the actors to grasp the importance of adopting a systemic perspective. Without a collective interpretation of the objective and a system vision, actions were defined by layering various proposals, without making any real link with the objectives to be achieved. The absence of a creative process forced the collective to repeat old public action logic. The implementation processes, based on delegations, largely collided with the diversity of actors' visions. The interconnections between the instruments were too weak to allow mutual readjustments and collective learning. Finally, the State's attempt to turn to a "top-down" management resulted in a blockage of the management situation. These results allowed us to propose a framework for analyzing transitions policy processes and consolidating the management of future transition policy processes.

Our analysis does not pretend to provide miracle solutions to manage transitions. We believe, however, that it can help guide future research aimed at proposing new methods for the collective design of plans for systemic transitions towards sustainability, by urging the managers of this design, and in particular the policy-makers, to pay close attention to the three processes identified.

Acknowledgements

This work was supported by the "Growing and Protecting Crops Differently" French Priority Research Program, part of the national investment plan operated by the French National Research Agency (ANR) [grand number : ANR-20-PCPA-0001]; and the French Ministry of Agriculture.

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