A New Flood Control Concept in the Oise Catchment Area: Definition and Assessment of Flood Compatible Agricultural Activities

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Key words: flood, flooding, surplus flooding, surplus storage, protection.

SUMMARY

In recent years, flood protection policy has been reviewed to integrate flood risk acceptability per type of land use and to expect and accept more flooding in areas where the impacts are less significant. Agricultural activities in the flood plain of a river are automatically subject to flood risks. A tentative differential assessment of "natural" flood damage (the situation without improvement works) compared to occasional "surplus" flood damage in surplus storage areas (the situation with improvement works) was carried out. First of all, the study assessed the effects of flooding on the soils and crops by examining bibliographic sources and conducting a survey among the agricultural profession involved in steering this study. The impacts on forest species and wetlands were also assessed. Finally, a test was conducted on three pre-identified sites to assess damage likely to be caused during floods when the planned works have been built. The results of the test were used to roughly estimate the compensation farmers should receive for the "surplus" damage. The study also examined the legal, administrative and land organization background necessary to implement the proposed improvements and the need for "surplus flood servitudes", which are likely to place restrictions on agricultural practice.

RÉSUMÉ

Les stratégies de protection contre les inondations ont été révisés dans les dernières années, dans le sens d'une meilleure prise en compte de l'acceptabilité de ce risque selon l'occupation des sols et en envisageant d'accepter des inondations plus importantes dans les zones de moindre impact. Les activités agricoles pratiquées dans le lit majeur des rivières sont naturellement soumises à l'aléa inondation. L'impact négatif de la sur-inondation occasionnelle des terrains compris dans les aires de sur-stockage a fait l'objet d'une tentative d'évaluation différentielle des dommages provoqués par l'inondation en comparant les deux situations : sans aménagement et avec aménagement. L'étude a d'abord porté sur l'évaluation de l'incidence de l'inondation sur les sols et sur les cultures à travers l'analyse de sources bibliographiques et par enquête auprès de la profession agricole associée au pilotage de cette étude, ainsi que sur les espèces forestières et sur les zones humides. Une application test a finalement été conduite pour évaluer les dommages susceptibles d'être provoqués par le fonctionnement, en crue, des ouvrages projetés, sur trois sites potentiels identifiés. Sur cette base, on a évalué l'ordre de grandeur des indemnités à consentir aux agriculteurs pour les sur-dégâts. L'étude a également traité des dispositions juridiques, administratives et

d'aménagement fonciers à retenir pour une mise en œuvre des aménagements envisagés qui imposeront nécessairement des "servitudes de sur-inondabilité" susceptibles de limiter les pratiques agricoles autorisées.

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1. FLOOD PREVENTION IN THE OISE CATCHMENT AREA

1.1 L'Entente Interdépartementale Aisne et Oise

(The interdepartmental Aisne and Oise river basin management committee, the “Entente”) began to work on a new approach to flood protection in 2000. Among others, the job included publishing a study by BRL *ingénierie* and FIEF (Fédération Internationale des Etudes Foncières): “Definition and assessment of a series of flood-compatible agricultural activities”.

The extreme floods on the Oise and Aisne rivers in December 1993 and February 1995 were present in people’s minds and had made them aware that:

- it is impossible to totally eliminate all risks of flooding,
- comprehensive measures are necessary at community level to limit potential flood damage from extreme floods.

Considering the amounts of water at stake and the return periods of the flood events, it is difficult to ensure complete protection for urban areas. When seeking to improve flood protection for housing areas, building additional works to enhance the effectiveness of existing flood propagation areas and/or to increase the amount of water stored in such areas are interesting tracks to explore. Evacuating flood water obeys certain “elementary” principles: a solution in one place may transfer the problem elsewhere and even aggravate it in a lower-lying area.

Consequently, all the different local partners must come to an agreement on how to control major hydrological events in the whole catchment area. It has thus become clear that some kind of active solidarity between urban and rural areas in the upper parts of the basin is necessary: these areas can and must be used to receive flood waters. As they already receive most of the rainfall in the upper Oise and Aisne catchment area, it is necessary to find a way of slowing storm runoff during the most critical periods, i.e. a few weeks per year.

These rural areas, which would only rarely be used for this purpose during extreme floods, are subject to high pressure for development, which tends to reduce their natural flood control and dynamic slowing potential. Measures must therefore be designed to protect them.

1.2 Dynamic Flood Slowing

The idea of flood slowing came up for two reasons:

- zero flood risks is impossible,

– the memories of natural flood risks is vanishing in inhabitants minds.

Therefore, whatever action is taken to control flooding, it is important to lay the emphasis on two points:

- **It is always necessary to consider the issues comprehensively** and the solution is never a separate or specific series of measures.
- It is absolutely necessary to be aware that, despite the extent of the works performed, **even the best protected flood-prone areas are vulnerable**; and in such areas everyone (according to rank and responsibilities) must make sure that all the necessary steps have been taken to limit the danger and the risk.

Flood slowing consists of:

- slowing the storm water flow to reduce flood risks during critical periods;
- to achieve this, storing water for as long as possible in traditionally flooded areas, and if possible, beyond the limits of the naturally inundated area as well;
- and consequently, increasing the occurrences of flooding in the affected crop-growing areas .

The report by M. DUNGLAS (November 1996) thus recommends a coordinated series of actions to restore the role played by flood spreading areas instead of just building flood control dams:

- preserving existing flood spreading areas;
- transforming certain flood spreading areas into surplus storage areas;
- extending certain existing fields;
- creating new, artificial surplus storage areas.

Arranging surplus storage and artificial storage areas imposes limitations, sometimes prejudicial ones, on local farming and forestry activities:

- Firstly, because of the physical presence of dikes, even if they are not very high and relatively flat.
- It may also cause random visible damage to crops and plantations, delay grassing for livestock and delay cultivation work in a variable manner depending on the extent of flooding, its frequency and the time of year when the floods occur.

Under current legislation, the consent of the owner is required. This can be materialised in a contract with a project coordinator, for example the *Entente*, including compensation. Considering that the risk is a random one, assessing the appropriate type of compensation is not a straightforward task. There are no suitable methods for calculation to date. It will only be possible to develop them after discussions with the agricultural profession and an **in-depth study.**

It is important to interpret the expression "flood compatible agricultural activities" in this sense. It is not a matter of finding naturally compatible activities (no activities are really compatible), but of organizing a consultation process to obtain as precise as possible an estimate, and mutual, equitable commitments between agricultural professionals and the Entente.

2. DELIMITATION OF THE STUDY AREA

The study covers the catchment area of the Oise, Aisne and Aire rivers and their tributaries which includes the following:

- agricultural areas, including those included in flood protection schemes and sites of special interest (natural areas of ecological, faunistic and/or floristic interest, interesting bird areas, etc.);
- woodland areas, including protected woodland areas;
- natural areas, i.e. uncultivated or partly cultivated areas, most of which represent definite ecological potential.

Within the catchment area, the following are identified in each surplus storage area:

- the frequently flooded parts of the flood plain in which the development works create surplus flooding during heavy floods (the flooding is deeper and the land is under water longer);
- the less frequently flooded parts of the flood plain, in which the development works cause a greater surface area to be submerged during heavy floods, or even flooding in areas outside the flood plain.

Prior to this study, ISL consulting engineers performed a first stage of study to establish the hydraulic characteristics of the floods and define the structures to be built. Their work resulted in the identification of 69 flood surplus storage sites for a total 43 million m^3. These facts were used as a basis to develop the arguments used in this paper.

3. GENERAL HYDRAULIC CONSIDERATIONS

The watercourses were split into **28 homogeneous sections** according to:

- geology,
- slope and riverbed morphology,
- watercourse gradient,
- the presence of confluences.

The idea was to characterise and then to model the different flood damage parameters, namely:

- flow rate,
- flood return period,

- flood hydrographs,
- submersion time,
- submersion period,
- flood current velocity.

3.1 Bank-High Flow

Bank-High Flow is the flow rate beyond which the flood spreading area is submerged. This essential detail, partly available in the Master Plan for Water Management and Development, was calculated for each of the sections on the Aisne and Oise rivers. On the basis of these elements and the 1993 and 1995 flood hydrographs, it was possible to determine the submersion time on each of the different sections in a relatively precise manner.

The return periods of the reference flood events between 1962 and 1995 were detailed per section for certain events or considered at overall watercourse level. Thus, after examining the recurrence frequency and the documentation available on the various recent flood events, the 1993 flood was selected as being the characteristic flood event for which the flood protection measures should be designed.

It was then possible to simulate the behaviour of a flood of this kind after the construction of surplus storage works and to estimate the duration, depth and velocity of the flood flow in each of the different sections.

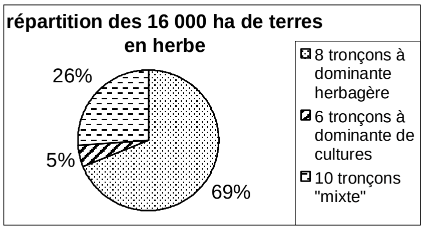
According to the submersion times and return periods per section, the results are very long submersion times similar to those produced by the winter flood with a return period of between 30 and 70 years.

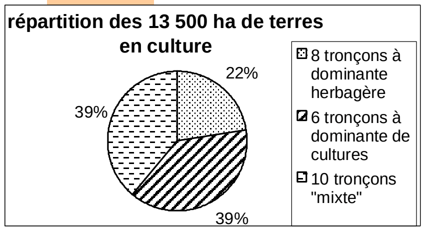
4. LAND COVER

For each hydraulic section previously defined, the distribution of submerged land during the highest floodwaters is given according to simplified **Corine Land Cover** nomenclature, differentiating five main types of area.

The areas likely to be affected by the surplus flooding are grassland, cultivated land, natural areas and even woodland, in other words all zones except for built up areas.

	8 tronçons à dominante herbagère	6 tronçons à dominante de cultures	10 tronçons "mixte"	Total OISE+AISNE (24 tronçons)
Zones urbanisées et anthropisées	363	590	2 390	**3 343**
Prairies	11 207	797	4 239	**16 243**
Cultures	3 014	5 226	5 225	**13 465**
Zones naturelles, forêts et landes	1 984	2 446	5 567	**9 997**
Zones humides et surfaces en eau	198	95	1 538	**1 831**
Total (ha)	16 766	9 153	18 960	**44 879**





5. ASSESSMENT OF THE EFFECTS OF SURPLUS FLOODING ON CROPS AND NATURAL HABITATS

Bibliographic sources provide a little information about the resistance of crops, soils and tree species to floods. This information was incorporated in evaluation grids to assess the resistance (or sensitivity) of the different habitats to flooding. By comparing some of the grids, it was possible to obtain an assessment of the effects of surplus flooding on crops, natural wetlands and woodland.
As we can see, both the different land cover components and the impacts of surplus flooding were assessed. But of course, the quantitative assessment and discussions with the farmers only concerned the cropland. This is presented below.

5.1 Flood Damage to Crops – Fact Sheets

There is very little bibliographic data available to report on the damage floods cause to crops. The following table gives the principle values proposed by Water Agencies in terms of submersion time and the acceptable depth of floodwaters. [1]

[1] From « Qualifying land vulnerability to flooding » - post-graduate studies memorandum, Elisabeth DESBOS - CEMAGREF Lyon – INSA Lyon – September 1995, completed in 1997.
Adapted in the Water Agencies' Practical guide to the « floodability » method, inter-agency study n°60 – 1998.

Guideline norms - Maximum admissible values for rural areas

Vulnerability criteria➔ Land cover 🡣	Flood season	Maximum submersion time	Maximum depth of flood waters	Maximum submersion frequency	Maximum flow velocity
Vegetables Field vegetables Horticulture	spring summer/autumn	Instantaneous to 1 d 1 to 3 d		5 years 5 years	0.25 m/s 0.25 m/s
Greenhouses	all year	1 to 3 d	1 m	5 years	
Land cultivated in spring	spring/summer winter autumn	8 d 1 month 1 month		5 years 1 year 1 year	
Land cultivated in winter	winter spring/summer autumn	1 month 3 d 8 d		10 years 1 year 1 year	
Vine plants	summer autumn winter	instantaneous instantaneous 1 month	0.5 m 0.5 m 0.5 m	10 years 10 years 5 years	0.25 m/s 0.25 m/s
Orchards	spring/summer forest crown soil winter	1 d 3 to 5 d 1 month	1 m	10 years 1 year 1 year	0.5 m/s 0.3 m/s
Permanent grassland	spring autumn/winter	10 d 1 month		1 year	
Woodland, forest		1 week to 1 month		1 year	

These data are taken from a survey among farmers and represent a reference to be considered as interesting in the frame of this study.
The summary of the survey carried out under M. Salamin's supervision is another useful source of data.
The two most significant parameters necessary for a theoretical assessment of constraints for cropping are:

– the submersion period: what time of year and what stage in the agricultural year, and
– submersion time.

Other parameters are also significant but we lack quantified data on their impacts, namely:

– the depth of water above the crops, and
– the velocity of the water.

The following fact sheets were designed for the main agricultural options involved. They are theoretical models containing data from bibliographic sources, working meetings and Chambers of Agriculture.

The complete design of a crop fact sheet covers all the following:

- month of year; the shaded part of the calendar is the season during which crop damage is considered to be minimal, and the farmer is responsible for the risk and the consequences of planting crops that are sensitive to water.
- submersion time, there are four classes, D3, D7, D11 and D15 corresponding to the number of days of submersion
- depth of water: there are three depth classes, H1, H2 and H3.
- the velocity of the water: also in three classes.

Incidence des paramètres hydrauliques sur les spéculations agricoles
durée de submersion - hauteur de lame d'eau - vitesse d'écoulement

D = Durée submersion (en jours) y compris temps de ressuyage		H = Hauteur d'eau (en m)		V = Vitesse (en m/s)	
Nbre de jours	Code	Mètre	Code	Mètre/sec	Code
3	D3	< à 0,5	H1	< à 0,25	V1
7	D7	[0,5 à 1]	H2	[0,25 à 1]	V2
11	D11	> 1	H3	> à 1	V3
15	D15				

Culture **MAÏS**

dégâts en pourcentage
(en rouge pour tout ce qui est à 100%)

		D3			D7			D11			D15		
		V1	V2	V3	V1	V2	V3	V1	V2	V3	V1	V2	V3
Janvier	H3												
	H2												
	H1												
Février	H3												
	H2												
	H1												
Mars	H3												
	H2												
	H1												
Avril	H3	30	60	90	60	100	100	100	100	100	100	100	100
	H2	20	40	60	40	100	100	80	100	100	100	100	100
	H1	10	20	30	20	50	100	40	80	100	60	100	100
Mai	H3	30	60	100	90	100	100	100	100	100	100	100	100
	H2	20	40	80	60	100	100	100	100	100	100	100	100
	H1	10	20	40	30	50	100	80	100	100	100	100	100
Juin	H3	60	100	100	100	100	100	100	100	100	100	100	100
	H2	40	80	100	80	100	100	100	100	100	100	100	100
	H1	20	40	80	40	80	100	80	100	100	100	100	100
Juillet	H3	30	90	100	60	100	100	100	100	100	100	100	100
	H2	20	60	100	40	100	100	100	100	100	100	100	100
	H1	10	30	100	20	60	100	60	80	100	100	100	100
Août	H3	30	60	100	60	100	100	100	100	100	100	100	100
	H2	20	40	100	40	100	100	80	100	100	100	100	100
	H1	10	20	50	20	60	100	40	80	100	60	100	100
Septembre	H3	30	60	100	60	100	100	100	100	100	100	100	100
	H2	20	40	100	40	100	100	80	100	100	100	100	100
	H1	10	20	50	20	60	80	40	80	100	100	100	100
Octobre	H3	30	60	100	60	100	100	100	100	100	100	100	100
	H2	20	40	100	40	100	100	80	100	100	100	100	100
	H1	10	20	50	20	60	80	40	80	100	100	100	100
Novembre	H3	60	100	100	60	100	100	100	100	100	100	100	100
	H2	40	80	100	40	100	100	80	100	100	100	100	100
	H1	20	40	60	20	60	80	40	80	100	100	100	100
Décembre	H3												
	H2												
	H1												

Informations théoriques susceptibles de modifications selon les aléas locaux

Empty boxes are for insignificant situations or periods when the crops in question are not in the field.
Damage to crops is expressed as a percentage.

If the calculation principle expressed in these fact sheets is to be brought into use, it will be necessary to carry out field observations which will be the only way of confirming or rectifying the damage values (0 to 100%) in the different situations.

The agricultural profession asked for the following to be included in the assessment of damage due to surplus flood storage, in addition to the time of year at which the floods occur:

- the time during which access to the land is impossible: access to the fields also depends on the soil drying time, therefore on the type of soils present; therefore there will be a crop sheet per type of soil compatible for growing that crop in the agricultural region concerned.
- the differential height of the flood water table,
- the damage expressed in a monetary value per hectare: we therefore used the results provided by financial management centres and chamber of agriculture economic departments, which are often broken down by small agricultural region; there will therefore be a crop sheet per crop grown per small agricultural region.

The upper Oise valley is in the Thiérache province and the results obtained on properly run farms are provided by Soissons central agricultural advisory bureau: for grain maize in 1999, the reported values were FF. 10 425 per hectare of maize and FF. 7 631 per hectare gross margin (1 € = 6.55957 FF).

After discussions with the agricultural profession about the indicator to be selected for monetary assessments, it appeared better to use the gross output instead of the gross margin when assessing monetary damage due to surplus flooding.

Incidence des paramètres hydrauliques sur les spéculations agricoles
durée de submersion - hauteur de lame d'eau

en Francs/hectare	produit brut moyen 1999	marge brute moyenne 1999
	10 425	7 631

D = Durée submersion (en jours) y compris temps de ressuyage

nbre de jours	code
3 à 6	D3
7 à 10	D7
11 à 14	D11
15 et plus	D15

H = Hauteur d'eau

m.	code
< à 0,5	H1
[0,5 à 1]	H2
> 1	H3

Culture: MAÏS grain

perte totale de produit brut / perte partielle de produit brut; perte totale de marge brute / perte partielle de marge brute

Mois	H	D3 (3 à 6 j)	D7 (7 à 10 j)	D11 (11 à 14 j)	D15 (sup 14 j)	H	D3 (3 à 6 j)	D7 (7 à 10 j)	D11 (11 à 14 j)	D15 (sup 14 j)
Janvier	H3					H3				
	H2					H2				
	H1					H1				
Février	H3					H3				
	H2					H2				
	H1					H1				
Mars	H3					H3				
	H2					H2				
	H1					H1				
Avril	H3	6 255	10 425	10 425	10 425	H3	4 579	7 631	7 631	7 631
	H2	4 170	10 425	10 425	10 425	H2	3 052	7 631	7 631	7 631
	H1	2 085	5 213	8 340	10 425	H1	1 526	3 816	6 105	7 631
Mai	H3	6 255	10 425	10 425	10 425	H3	4 579	7 631	7 631	7 631
	H2	4 170	10 425	10 425	10 425	H2	3 052	7 631	7 631	7 631
	H1	2 085	5 213	10 425	10 425	H1	1 526	3 816	7 631	7 631
Juin	H3	10 425	10 425	10 425	10 425	H3	7 631	7 631	7 631	7 631
	H2	8 340	10 425	10 425	10 425	H2	6 105	7 631	7 631	7 631
	H1	4 170	8 340	10 425	10 425	H1	3 052	6 105	7 631	7 631
Juillet	H3	9 383	10 425	10 425	10 425	H3	6 868	7 631	7 631	7 631
	H2	6 255	10 425	10 425	10 425	H2	4 579	7 631	7 631	7 631
	H1	3 128	6 255	8 340	10 425	H1	2 289	4 579	6 105	7 631
Août	H3	6 255	10 425	10 425	10 425	H3	4 579	7 631	7 631	7 631
	H2	4 170	10 425	10 425	10 425	H2	3 052	7 631	7 631	7 631
	H1	2 085	6 255	8 340	10 425	H1	1 526	4 579	6 105	7 631
Septembre	H3	6 255	10 425	10 425	10 425	H3	4 579	7 631	7 631	7 631
	H2	4 170	10 425	10 425	10 425	H2	3 052	7 631	7 631	7 631
	H1	2 085	6 255	8 340	10 425	H1	1 526	4 579	6 105	7 631
Octobre	H3	6 255	10 425	10 425	10 425	H3	4 579	7 631	7 631	7 631
	H2	4 170	10 425	10 425	10 425	H2	3 052	7 631	7 631	7 631
	H1	2 085	6 255	8 340	10 425	H1	1 526	4 579	6 105	7 631
Novembre	H3	10 425	10 425	10 425	10 425	H3	7 631	7 631	7 631	7 631
	H2	8 340	10 425	10 425	10 425	H2	6 105	7 631	7 631	7 631
	H1	4 170	6 255	8 340	10 425	H1	3 052	4 579	6 105	7 631
Décembre	H3					H3				
	H2					H2				
	H1					H1				

Informations théoriques susceptibles de modifications selon les aléas locaux

6. ESTIMATED SURPLUS FLOOD DAMAGE TO CROPS WHEN SURPLUS FLOODING IS INTRODUCED

Three pilot sites in the Oise valley were modelled in order to assess the effects of surplus flooding. The modelling work produced an assessment of the submersion “depth” and “time” parameters for a **set of structures to be built** to store surplus flood water.

The expected impacts on the three pilot sites can be summarized as follows:

Compared to a natural 1993 type flood, the use of surplus flooding will produce the following effects on the three test sites: Autreppes, Erlou and Proisy:

– a 76 ha increase in inundated surface area,
– a one day increase in inundation time downstream of the pilot sites,
– a three day increase in inundation time at the most in surplus storage areas,
– soil drying time will be up to two days,
– the flood waters will be up to 2.5 metres deeper.
–

As regards the frequency at which the effects of the surplus storage occur, it was calculated on the basis of the dimensions of mobile flap gates, which allow the usual floods to flow through them. The flow regime in the Oise river would therefore be unchanged for flow rates that are below the set gate operation flow rate or for any floods with a return period below:

- 15 years on site 3 (Autreppes) – flow unchanged if Q < 143 m/s,
- 12 years on site 4 (Erloy) – flow unchanged if Q < 137 m/s,
- 9 years on site 6 (Proisy) – flow unchanged if Q < 130 m/s.

From here onwards, knowing the hydraulic effects on the one hand and the crops and their respective sensitivity in terms of potential loss of gross margin on the other, it is possible to estimate the financial impacts of the works to be expected.
The results are presented in the following diagrams.

6.1 Estimating the Financial Stakes

Using the test sites, we attempted to generalize the results in order to obtain a rough idea of the scope of the damage to be expected, and thus of the provisions to be made for financial compensation. Altogether, for all the surplus storage sites planned, the values obtained are the following:

Evaluation des sur-dégâts de sur-stockage dans les champs d'expansion des crues - SITE N°3

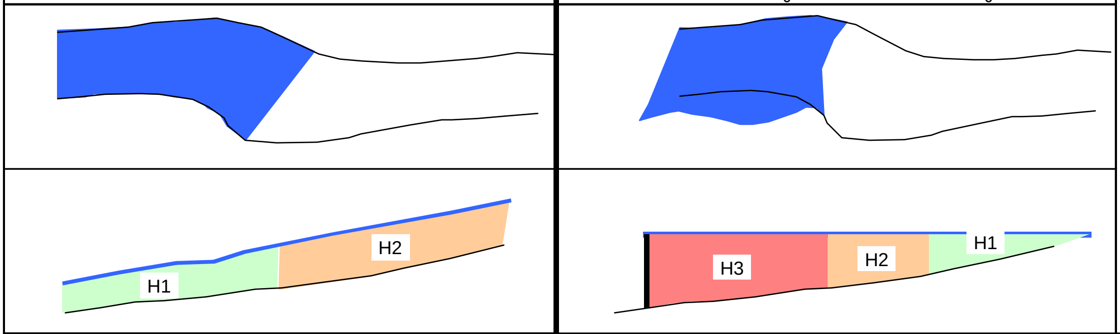
Occupation du sol au moment de l'inondation - élevage 91% - maïs 4% - zones naturelles 5%

période de l'année - Novembre - crue type décembre 93

paramètres hydrauliques au droit de la zone de sur-stockage

Sources - BRL Ingénierie et ISL - 2000

Situation actuelle - inondation naturelle	Situation aménagée - création d'un sur-stockage



SITE 3

avant aménagements			après aménagements			différence
Surface inondée (Ha)		164	Surface inondée (Ha)		192	+ 28 Ha
Durée de submersion		3 jours	Durée de submersion		6 jours	+ 3 jours
Vitesse pendant le stockage		0.5 m/s	Vitesse pendant le stockage		< à 0.5 m/s	non significatif
Vitesse en vidange		» 0.5 m/s	Vitesse en vidange		0.6 m/s	non significatif
Hauteur de crue naturelle maximum		0.375	Hauteur de crue naturelle maximum		2.75	+ 2,4 mètres
Répartition des classes de hauteur d'eau :			Répartition des classes de hauteur d'eau :			
H1 (< à 0,5 mètre)	H1	50%	H1 (< à 0,5 mètre)	H1	20%	
H2 [0,5 à 1 mètre]	H2	50%	H2 [0,5 à 1 mètre]	H2	20%	
H3 > 1 mètre	H3	0%	H3 > 1 mètre	H3	60%	
type de sol - alluviaux			type de sol - alluviaux			
Sensibilité à l'inondation		faible	Sensibilité à l'inondation		faible	non significatif
nature du sol - argiles			nature du sol - argiles			
Sensibilité à l'érosion		forte si maïs - faible autrement	Sensibilité à l'érosion		forte si maïs - faible autrement	non significatif
Temps de ressuyage avec :			Temps de ressuyage avec :			
Temps de vidange		Néant	Temps de vidange		pratiquement 1 jour	
Ressuyage du sol		1 jour	Ressuyage du sol		1 jour	
Délai de retour sur les terres		entre 5 jours sur terre labourée et 3 semaines sur pâture salie	Délai de retour sur les terres		au minimum 1 semaine	
TOTAL :		9 jours au minimum	TOTAL :		15 jours au minimum	+ 6 jours
Dégâts aux cultures en %	D3	herbe 0%	Dégâts aux cultures en %	D7	herbe 14%	14%
	V2	maïs 80%		V2	maïs 96%	16%
	H1, H2 et H3			H1, H2 et H3		

paramètres économiques des spéculations de la zone de sur-stockage

élevage	produit brut	2400	F/ha
	marge brute	9000	F/ha SFP
maïs	produit brut	10425	F/ha
	marge brute	7631	F/ha

différence = sur-dégâts

élevage	perte totale produit brut	58 706	F
	perte totale marge brute	220 147	F
maïs	perte totale produit brut	22 151	F
	perte totale marge brute	16 214	F

Evolution of flooded area in hectares (all sites equipped)

	Flooded area	Surplus flood area
OISE	7 763	7 994
AISNE	6 071	6 449
TOTAL	13 834	14 443

Estimated total damage due to surplus flooding in French Francs (all sites equipped, 1 € ≈ 6.55 FF)

	Loss in gross output for livestock	Loss in gross output for maize	Total loss in gross output	Loss in gross margin for livestock	Loss in gross margin for maize	Total loss in gross margin
OISE	4 313 095	1 191 935	5 505 030	5 752 145	859 411	6 611 557
AISNE	808 735	3 421 404	4 230 139	2 154 913	2 451 081	4 605 994
TOTAL	5 121 830	4 613 339	9 735 169	7 907 058	3 310 492	11 217 550

Whether they are expressed in terms of loss in gross output or in gross margin, the results are very similar, indicating that the damage due to surplus flooding would amount to roughly 10 million French Francs (approx.1 500 000 €). However, it is important to note that the difference between sections is sometimes very high.

7. LAND TENURE, LEGAL AND ADMINISTRATIVE ASPECTS

In parallel to the technical aspects related to the definition of the structures to be built and to the methods for assessing the surplus flood damage, an approach to the definition of legal conditions and management mechanisms was also conducted.

Before the contractual stage, it will be necessary to follow some special procedure. The different stages are the following.

7.1 Surplus Flooding – an Occasional Risk

Damage due to ordinary present-day floods is a normal risk for farmers. The *Entente* is not in charge of covering these risks.
With deliberate surplus flooding, there will automatically be payment of compensation by the owner of the structures causing the damage.

7.2 Adapting Farm Systems

The new conditions for cultivating land in surplus flood areas, which will be the result of both the consideration of the risks and the limitations imposed on cropping (e.g. a ban on ploughing between 1st November and 30th April), will incite farmers to adapt their production systems. In any case, every new obligation will have to find compensation.

7.3 The Future Water Law

The draft law presented in 2002 plans to introduce public utility servitudes to permit the following:

- occasional inundation of land in "flood water storage areas";
- movement of the normal river bed into "free-flowing areas";
- bans on certain forms of agricultural practice in "protected strips".

But the paper was not approved and is to be re-examined and reformulated in the coming months. Until the law exists, what can be done today? Which legal mechanisms are the most appropriate? The current water law (1992) does not really answer the needs of the situation.

7.4 "General Interest Programs" (GIPs)

However, General Interest Programs (GIP), as defined in article L 121-12 of the Town Planning Code, have several advantages, listed below:

- they provide general, official information to the public about the existence of large-scale projects,
- they mobilize the appropriate State departments to carry out the actions leading to project implementation;
- they inform the local authorities that they may need to modify or review their land-use plans to convert areas presumed liable to surplus flooding into non constructible areas;
- they are the basis for all public utility declarations for the construction of essential infrastructure;
- they constitute the arguments for presenting draft bilateral contracts to property owners in order to establish servitudes and rights of way for various installations.

Despite the above, a GIP in itself cannot create servitudes or authorize even temporary use of land, access, site investigations or preparatory topographic survey work on other people's land.

7.5 The 29th December 1892 Law

This law, still applicable, concerns the construction of community infrastructure and public works.
Article 1 of this Law stipulates that "personnel from the authorities or the entities empowered by the authorities may not enter private property to perform operations necessary in the frame of public works, civilian or military projects implemented on behalf of the State, French Departments or Communes unless a Prefectoral Order stating the Communes in the study area to be covered has been issued".
Consequently, the combination of the GIP mechanism, as an administrative reference that the State is taking the surplus flooding project into account, and the Law of 1892 permitting access to private property, is a guarantee that the operations are administratively and legally compliant.

7.6 Mutual Agreement Contracts

7.6.1 Concerning the Procedure

In the absence of the new water law that would have created public utility servitudes, mutual agreement contracts need to be established.
In addition, property owners wishing to sell can make mutual agreement settlements. Even so, it does not appear appropriate for the *Entente* to become a landowner.
On the other hand, except for the main structures, expropriation of surplus flooded property belonging to an opposer would be qualified as misappropriation of procedure, since flood hazard exposure is not sufficient, by law, to deprive someone of their property.

7.6.2 Compensation

The same mutual agreement contract would deal with compensation as well, which will obviously not be able to be settled by mutual agreement.
However, if certain arrangements are made, such as forming a committee to assess damage and propose compensation, the committee being chaired by an independent authority and calling in experts if necessary, it would probably encourage the majority of the people involved to accept the assessments made and compensation proposed by the committee. This procedure could rapidly be introduced.

Moreover, if such proposals are refused, the corresponding financial amounts could be reserved while an administrative claim is filed. But this should not be considered to be a general prerogative because it would be impossible to take this kind of action in any other than exceptional circumstances. However, the easiest solution to manage would definitely be to contractualize the payment of compensation, taking the above hypotheses into account, through an insurance company, whose entire purpose is based on the acceptance of random risks. The *Entente* would pay the premiums.
The same goes for any other risks related to all the responsibilities arising in the frame of the actions taken by the Entente Interdépartementale.

7.7 How will it Work in the Future?

After outlining the legal and contractual framework, the future organisation for decision-making, coordination, project preparation, ensuring consistent action between the different project managers and administration.

Whatever the circumstances, the *Entente* must continue to perform the following functions:

- initiating administrative procedure,
- ensuring that the actions taken are consistent according to its own planning schedule,
- approving specifications,
- signing contracts, pronouncing the final acceptance of the works and paying.

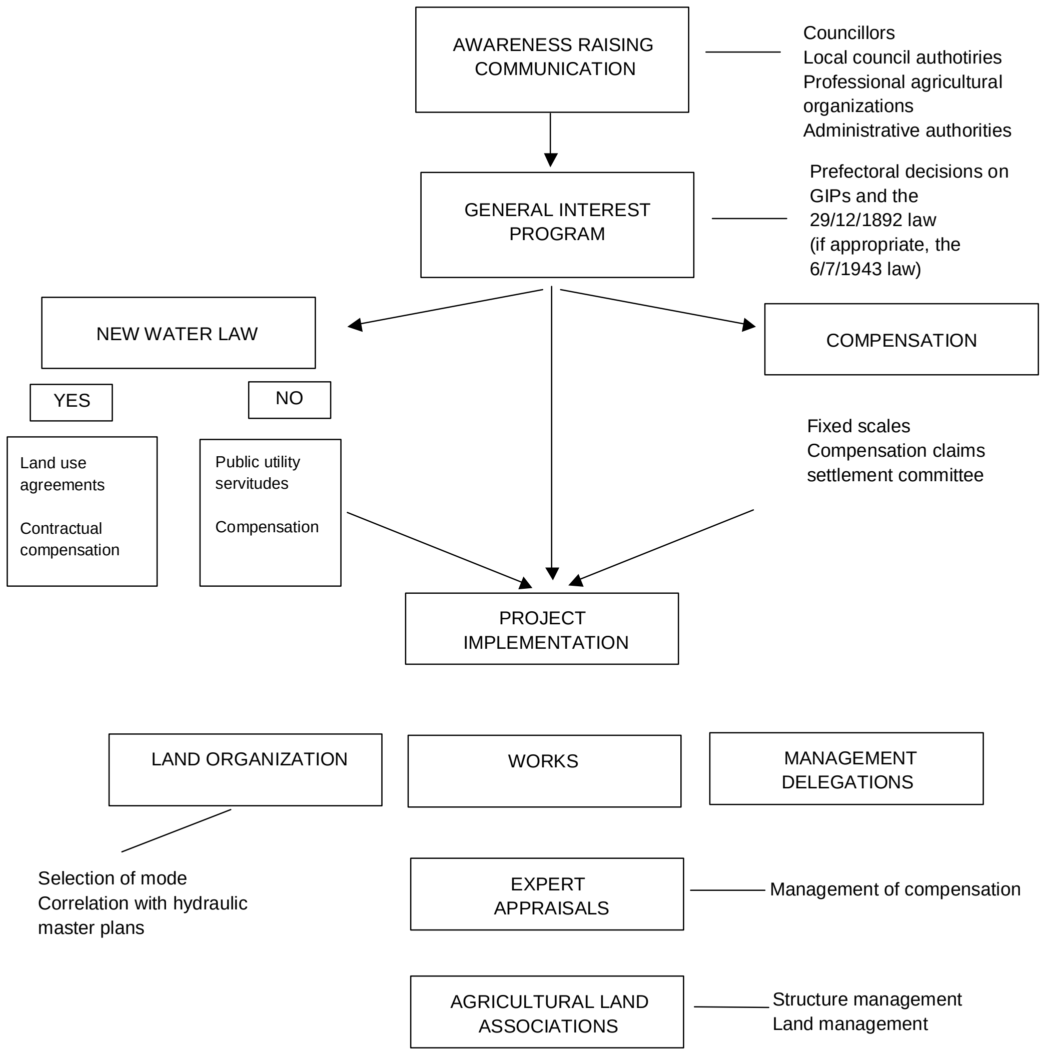
In addition, the *Entente* must also continue to coordinate and supervise site exploration and location prior to the operations themselves.
Lastly, the *Entente* will be in charge of finding works supervisors and ensuring that one or several consultants perform all of the technical phases of the projects.
In reality, due to the fact that the area of influence of the *Entent*e is divided into numerous sub-blocks as previously mentioned, and that certain technical, economic and sociological dispositions exist, numerous different service providers are involved and there is a considerable amount of diversity in the situations encountered, which will require specific assessment and methods to settle each of the problems likely to be encountered.

In this context, it will be appropriate to consider which organization or institution is competent (skills, status, complementarity), e.g. not only the consultants or project managers but also the operations supervisors such as Departmental Agriculture and Forest Authorities, Departmental Equipment Authorities, the Seine Navigation Authority and Chambers of Agriculture (who will probably need to assist the main operations supervisors).

This kind of delegation means:

- (obviously) payment of the service providers, selected on the basis of bidding operations;
- assistance to the *Entente* through a small group of experts in specific fields such as hydraulics, agronomy, civil engineering, land organization, which would enable the Entente to be operational in all of the above-mentioned fields, especially in terms of technical and administrative coordination between the different departments.

Taking all of the above into account, along with an analysis of procedure, which is yet to receive technical criticism, and the work the *Entente* has already begun, namely communications, the following diagram expresses in a simplified form the future phases of the surplus flooding project.


AWARENESS RAISING COMMUNICATION
Councillors
Local council authotiries
Professional agricultural organizations
Administrative authorities
GENERAL INTEREST PROGRAM
Prefectoral decisions on GIPs and the 29/12/1892 law (if appropriate, the 6/7/1943 law)
NEW WATER LAW
COMPENSATION
YES
NO
Land use agreements
Contractual compensation
Public utility servitudes
Compensation
Fixed scales
Compensation claims settlement committee
PROJECT IMPLEMENTATION
LAND ORGANIZATION
WORKS
MANAGEMENT DELEGATIONS
Selection of mode
Correlation with hydraulic master plans
EXPERT APPRAISALS
Management of compensation
AGRICULTURAL LAND ASSOCIATIONS
Structure management
Land management

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