SOFT WHEAT: VIEW FROM FRANCE
(SLIDE 1)

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I am very glad to be with you this morning for discussing some problems on "soft wheat: view from France". I shall speak on the subjects of production, import/export, usages, quality testing and of future trends.

Wheat Production Aspects

As shown on SLIDE 2, France (in the framework of E.E.C.) is the fifth producer of wheat in the world, after USSR, China, USA and India.

As the largest producer of wheat in Europe (with about 40 % of all bread wheats) and as a central trading member of the European Economic Community (E.E.C.), France occupies a key position in the wheat economy of Western Europe due to its geographical conditions, adequate soils and technicity of its farmers.

The cereal sector is the main backbone of the French agriculture and makes the basis of its aptitude for exportation: as will be seen below. France is now also the fourth exporter in the world.

On SLIDE 3 the main wheat growing areas of France are indicated: Paris Basin, Beauce, Brie, Picardie, Centre-East, Centre-West, and South West. Although wheat is grown in every département of France, the 17 départements in the north supply 70 % of the crop.

French wheat areas, yields and production for 1983-88 are presented on SLIDE 4.

In a general point of view, this production is characterized as follows:

1) French wheat production has doubled in the last 30 years, and crop yields have increased 3.5 times, while the area sown to wheat has shrunk by 30 to 40 % and now comprises 1/10 of France only (about 5 millions of ha).

2) A very intensive-type cultivation: average yield of 55-60 q/ha, still on a continuous increase (SLIDE 5). The Paris Basin and the northern areas produce extremely high wheat yields (higher than 100 q/ha in many

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places). In the south, the yields are somewhat lower owing to hotter, drier conditions, causing premature ripening. The average yields of the country could go beyond 80 q/ha towards the end of the century.

3) (SLIDE 6) Large variations in quality between regions (due to the relatively small size of productive areas, compared to North America, Australia, or Argentina), and a strong year effect resulting in a variable quality.

4) France has no grading system equivalent to that of many other countries which can market in this way constant and homogeneous wheats. Although excellent in concept, the grading system (attempted by ONIC to encourage the growing of high-quality wheats) has always found little commercial acceptance in France because of the above-mentionned variations in quality.

5) French environmental conditions make it difficult to produce very strong and high-protein varieties with competitive yields. Few areas (located in the south) have the aptitude to produce such varieties (Prinqual, Florence-Aurore, Aubaine). But the routing costs may make them more expansive in Paris area than imported wheats. On the other hand, when grown in the north, these varieties are less good than when grown in the south.

6) The importance of the concept of variety in the home grain trade: millers and other members of the wheat sector use to carry out electrophoretic inspections of varieties (SLIDE 7) on wheat samples taken from as many as several thousands of deliveries per year (one sample means 50 kernels individually run in electrophoresis).

However, both breeders' efforts and improvements of cultural techniques made it possible to combine on a given variety several characteristics that looked incompatible a few years ago. For instance, the new cultivars Apollo and Créneau can reach the same yields as cv. Monza, a hybrid-type wheat; even the good baking quality cultivars Récital and Camp Rémy do not yield significantly less than non baking wheats such as Arminda and Promentin.

On the other hand, French exportations have considerably increased these last years. In 1987, they represented 14 millions of tons, i.e. two thirds of the total collected grain (SLIDE 8). Of these, 45 % go to

E.E.C. countries (Italy, Netherlands, Germany, Belgium) and 55 % to non E.E.C. countries (U.S.S.R., China, Poland, Egypt). About 4 millions of tons are shipped to third countries. This in spite of regional disparities that make French wheats more difficult to export, in comparison to countries which produce homogeneous types due to an efficient grading system. As a consequence, France tends to import much smaller amounts of wheat than in the past: 100,000 tons only, i.e. 0.3 % of the production, or 1.1 % of the domestic uses.

Traditional Uses of Soft Wheat in France

(SLIDE 9) From 100 tons of wheat collected, 55-60 are exported, plus 10 other % exported as flours. Therefore, one third only is used domestically. Among this, 9 % are fed to animals, and 21 % are used as home flours.

As the largest use of domestic flours is bread production, bread-baking potential is the prime quality consideration (SLIDE 10). In 1987, 72 % of the French flour was baked into bread, the rest being used for ready-to-use flours (1.7 %), "biscottes" and "pain grillé" (3.6 %), crackers and biscuits (7 %), pastry (1.3 %), starch/gluten separation (7 %).

In France, as in all other Western nations, bread consumption has declined these last decades and no longer occupies a preeminent place in the dietary. It is well known, nevertheless, that, in France, bread continues to play an important socioeconomical role and that most consumers would not like to do without it. Most French consumers make daily purchases of fresh bread from small bakeries. More than 80 % of all bread is still produced by skilled workers (SLIDES 11+12) in 38,000 small bakeries, while about 10 % of all bread only is produced in industrial bakeries.

Typical French breads differ from the conventional American loaf in three essential respects:

a) They are essentially made of 4 constituants: flour, water, yeast, and salt, with little or none of the enriching ingredients such as shortenings, sugar, dry-milk, or potassium bromate (excepted fava bean flour and ascorbic acid). A formula, representative of the typical

French breads ("baguette", "pain parisien", "gros pain") is given on SLIDE 13.

b) They are normally baked on the hearth of the oven rather than in a pan (SLIDE 14).

c) The dough is cut with a blade immediatly before entering the oven (SLIDE 15).

French bread is thus characterized by a crisp eggshell crust (3-4 mm thick), an open grain (SLIDE 16), a full-bodied flavor, and a high crust: crumb ratio, especially in the long types such as the "baguette" (SLIDE 17), that represents more than 50 % of the bread produced in France.

All these facts have governed for many years the major requirements of wheat quality in France.

For instance, traditional bread-making required low-protein wheats (10.5-12 %), while, unlike in the English or American bread-making, very high protein contents were detrimental to French baking score or loaf volume (SLIDE 18).

For a long time, therefore, there has been a good agreement between requirements of the bakers and protein content of the wheats produced in the major growing areas of France. Today, protein contents, although slightly on the increase, are still low (SLIDE 19).

Also, baking quality specifications have been extensively based on the characteristics of Chopin Alveograph (SLIDE 20): W, P, G, especially on a satisfactory balance between the two main parameters: P (resistance to dough deformation), and G (dough extensibility) (SLIDE 21), the latter being perhaps more critical and sometimes a better indicator of the ability of a flour to French bread-making than the W index itself.

However, several things did change these last years. So let's move now to the:

<u>New or Recent Trends in French Bread-making and their Consequences on Wheat Quality Requirements</u> (SLIDE 22)

In the beginning of the 50's, the development of intensified kneading techniques began to bring new quality specifications consisting of an

increase demand in stronger flours. More recently, several other changes must be mentioned:

a) The decrease of manual handling of the dough and the mecanisation of the volumetric division.

b) The introduction of cold temperatures in a majority of bakeries: either dough cooling in order to control the growth and to limit the night work of the bakers; or dough freezing which is increasingly used by the bakeries located in supermarkets.

(For instance, as measured by the W index (Alveograph), the strength needed for baking has evolved from 100 in the 50's, to 150, then to 200 in the 70's, and today to at least 250, even for ordinary bread-making (baguette)).

c) Moreover, the rapid development of new products such as buns, fast-foods breads and rolls, now requires W indexes as high as 300 or 350.

d) On the other hand, new specifications in higher protein contents (up to 14 %) are resulting from the development of exportations.

So, the question arises as to whether French wheats of today are satisfactory for these new uses ?

The answer is yes, to a certain extent, due to the effective dialogue initiated among the different members of the wheat sector: breeders, farmers, storagers, millers, bakers, and scientists, in the framework of the CTPS Committee, resulting in the success of a policy of quality and a continuous increase of both yield and quality in the registered cultivars (SLIDE 23).

Concerning baking strength, W index has doubled in 30 years (SLIDE 24), while yelds have increased 3.5 times.

Most of the leading cultivars of today (that are all very high yielding) have either very good (registration class B1) or good (class B2) baking quality and 5 out of 9 are cultivars recommended by the milling industry (SLIDE 25). The non-baking wheats that increased at the end of the 70's (Maris Huntsman, Clement, Corin,...) are no longer a big concern in France.

Another example is grain hardness (SLIDE 26). It is generally believed that French wheats are extremely starchy and soft. However, newly developed cultivars (Thésée, Pernel, Castan) are relatively vitreous and could be classified as medium hard.

On the other hand, the fact that some cultivars are recommended by a personal engagement of the millers and can reach higher prices (SLIDE 27) is another illustration of the French policy of quality.

However, this is not enough to meet all flour quality requirements of today.

Besides genetic improvement of the cultivars, technology is extensively used by the millers.

According to the relative price level, they can use:

- either imported wheats, or strong wheats from south of France,

- or air-classified flours, or specific mill streams,

- or vital gluten

Today, as you know, it is the vital gluten which is the most largely used for improving both gluten content and baking strength in domestic and exported flours.

A considerable increase of wheat + starch production has occured these last 10 years (SLIDE 28). This increase did not result from a substitution of corn by wheat, but essentially from a specific development of wheat starch and gluten industries without any significant decrease of corn utilization.

It must be add that, like in many other countries, other industrial uses are under study in France: production of ethanol, paper industry, degradable detergents or plastics, both from starch/gluten separation or from whole wheat meal.

But their profitability depends, of course, on the prices of raw materials and on the relative price levels of starch and gluten. (For instance, in 1988, gluten prices have fallen down to 5.70 F/kg). This situation could call some openings in question again and, in general, it makes the agricultural impact of new industrial uses still difficult to predict today.

A specific situation of France results from the wheat yields that are very high and still on a rapid increase. In the future, however, any further intensification will not be obtained by higher amounts of fertilizer but rather through a more scientific control of the growing by the farmers and by Technical Institutes, which will result in lower costs per ton produced. This should contribute to further decrease the prices of raw materials and to stimulate new openings for wheat, such as ethanol production, for which the cost of raw material is especially critical. However, besides the decrease of the prices (and at least in the framework of the wheat world market, as it is shared today between Europe and North America) another negative consequence of this situation for the farmers, might be the necessity to freeze a significant part of the lands previously sown to wheat.

In conclusion, the main characteristics and future trends of soft wheats in France could be stated as follows (SLIDES 29+30):

1) Intensive wheat growing, very high yields, large regional variations in quality.

2) Importance of the variety concept for the millers (electrophoretic inspections).

3) Specificity of the French bread-making process and extensive use of Alveograph curve for quality specifications.

4) New bread-making technologies (dough cooling or freezing).

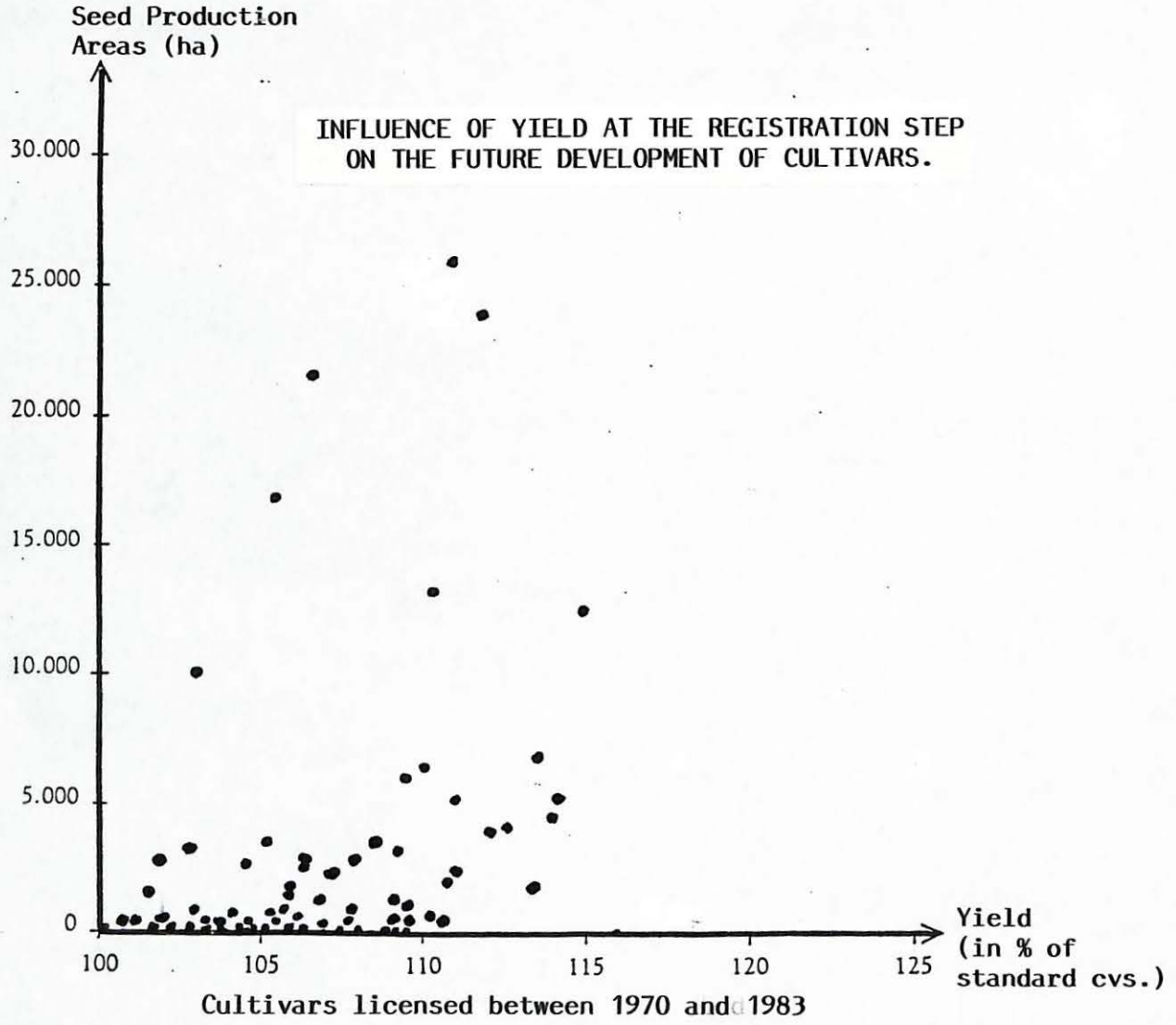
5) Regular increase of the level of baking strength required for standard French bread-making.

6) Considerable increase of gluten production and uses.

7) Agricultural impacts of other industrial openings (ethanol): still difficult to predict.

CHARACTERISTICS OF FRENCH WHEAT PRODUCTION

- Intensive growing and very high yields (still on a rapid increase)
  55-60 q/ha (in average)
  100 q/ha in many places)
- Relatively low protein content : 10-12.5 %
- Large regional disparities in quality level
- Extensive use of the Alveograpph criteria and of the traditional French baking test for quality specifications
- Importance of the concept of variety in the home grain trade
- Increase of the exportations


Seed Production
Areas (ha)
INFLUENCE OF YIELD AT THE REGISTRATION STEP
ON THE FUTURE DEVELOPMENT OF CULTIVARS.
30.000
25.000
20.000
15.000
10.000
5.000
0
100
105
110
115
120
125
Yield
(in % of
standard cvs.)
Cultivars licensed between 1970 and 1983

NEW CULTIVARS ASSOCIATE VERY HIGH YIELDS AND GOOD BAKING QUALITY

Cultivars	Quality Class	Averaged Yields (Q/ha) in 1987			
		North Picardie	Paris Basin	West	Center
Beauchamp	B2	76	82	99	82
Camp Rémy	B1	71	80	97	80
Pernel	B1	69	85	96	90
Festival	B2	71	79	97	79
Fidel	B2	65	80	87	78
Récital	B1	79	83	103	84
Thésée	B1	76	85	102	88
Promentin	D2	75	85	103	89

NEW TRENDS IN QUALITY REQUIREMENTS

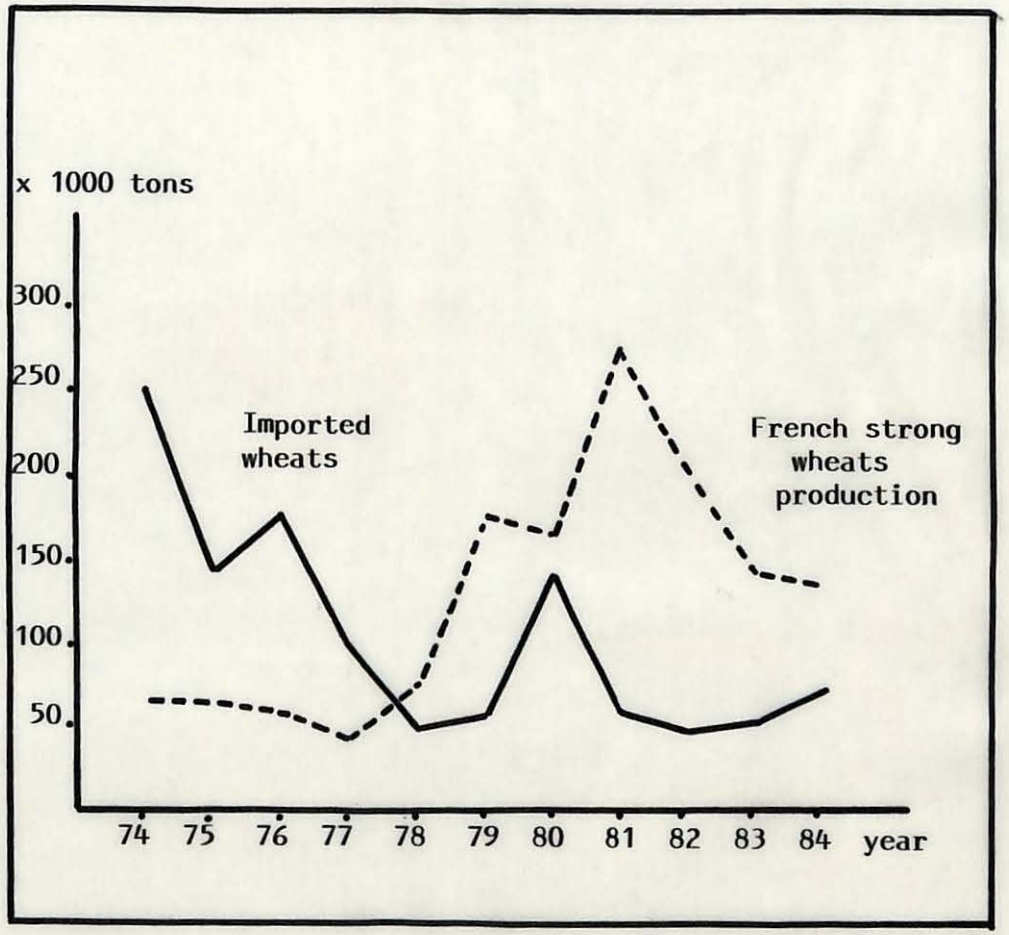
For many years, the traditional French bread could be obtained from relatively weak flours (Alveograph W : 100-150)

The baking technologies of to-day (intensified kneading; cooling for controlling the spring of the dough; use of frozen dough) require stronger wheats ($W \geqslant 250$)

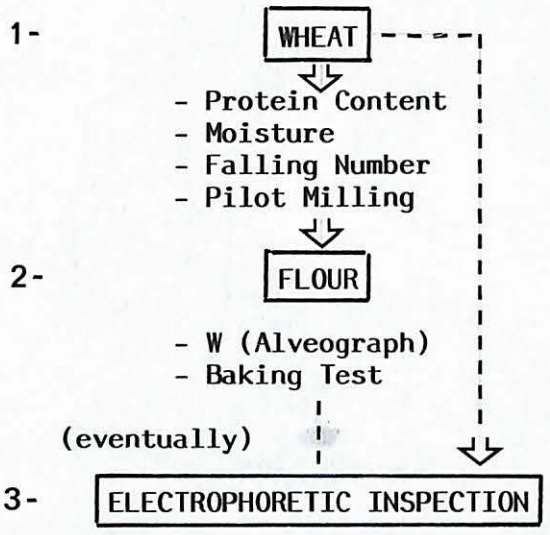
The rapid development of new specialty products (rolls, buns, fast-food breads, ...) now requires much stronger wheats ($W \geqslant 350$)

The increase of exportation also brought some specifications of higher strength and higher protein content than before

The millers can satisfy these demands by
- encouraging (bonus) the production of preferred cultivars
- adding vital gluten
- using mill streams or air-classified flours
- using very strong cultivars grown in Rhône Valley


x 1000 tons
300
250
200
150
100
50
Imported wheats
French strong wheats production
74
75
76
77
78
79
80
81
82
83
84
year

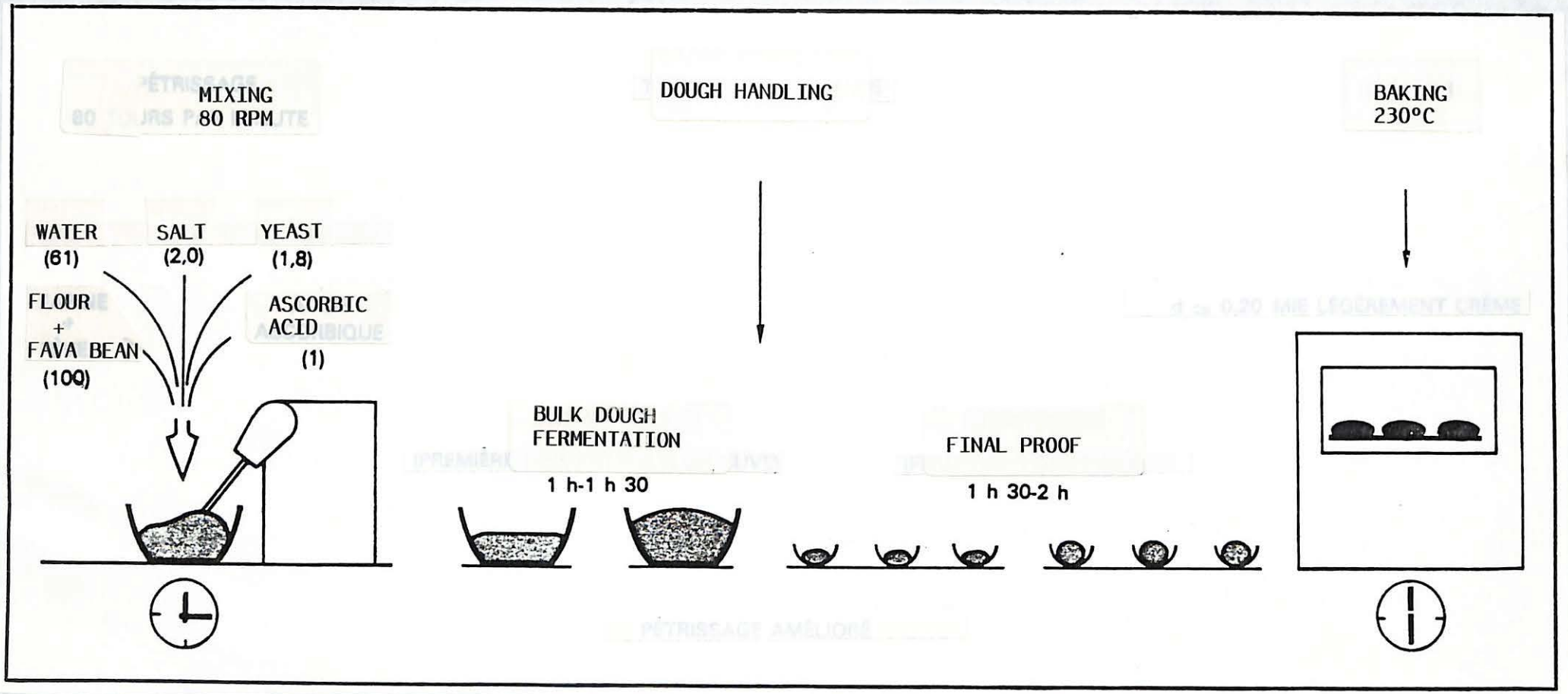
DETERMINATIONS USED BY THE MILLER
ON WHEAT DELIVERIES



of the varieties
from 50 kernels

FLOUR HOME MARKET (1987)

Traditional French Bread	72.0 %
Ready to use flours	1.7 %
Biscottes, Pain Grillé	3.6 %
Biscuits	7.0 %
Confectionary Products	1.3 %
Vital Gluten/Starch	7.0 %
Miscellaneous	7.4 %


MIXING
80 RPM
DOUGH HANDLING
BAKING
230°C
WATER
(61)
SALT
(2,0)
YEAST
(1,8)
FLOUR
+
FAVA BEAN
(100)
ASCORBIC
ACID
(1)
BULK DOUGH
FERMENTATION
1 h-1 h 30
FINAL PROOF
1 h 30-2 h

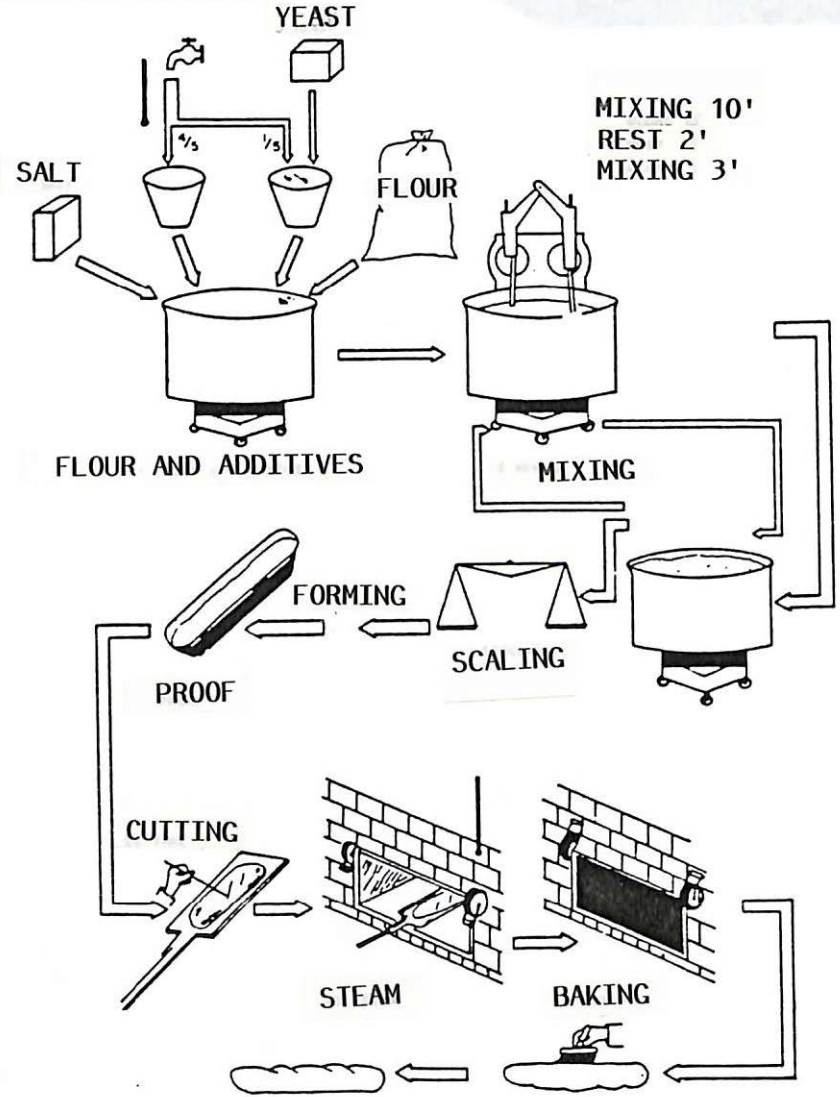


Figure 12-6. Schematic diagram of the manufacture of French bread. (From Bure, 1961.)

CONCLUSIONS

1 - Intensive wheat growing, very high yields, large regional differences in quality

2 - Importance of the variety concept for the millers (electrophoretic inspections)

3 - Specificity of the French breadmaking process and extensive use of Alveograph curve for quality specifications

4 - New breadmaking technologies (dough cooling or freezing)

5 - Regular increase of the level of baking strength required for standard French breadmaking

6 - Considerable increase of gluten production and uses

7 - Agricultural impacts of other industrial openings (ethanol) : still difficult to predict

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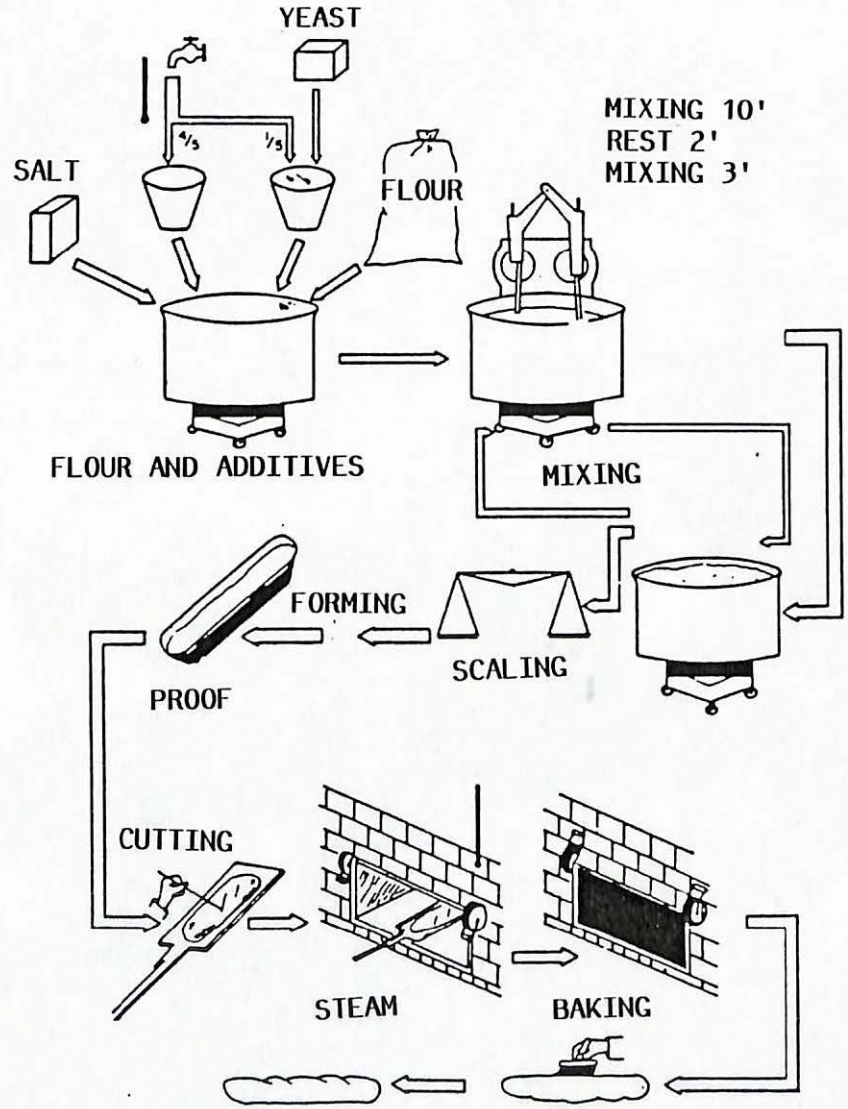

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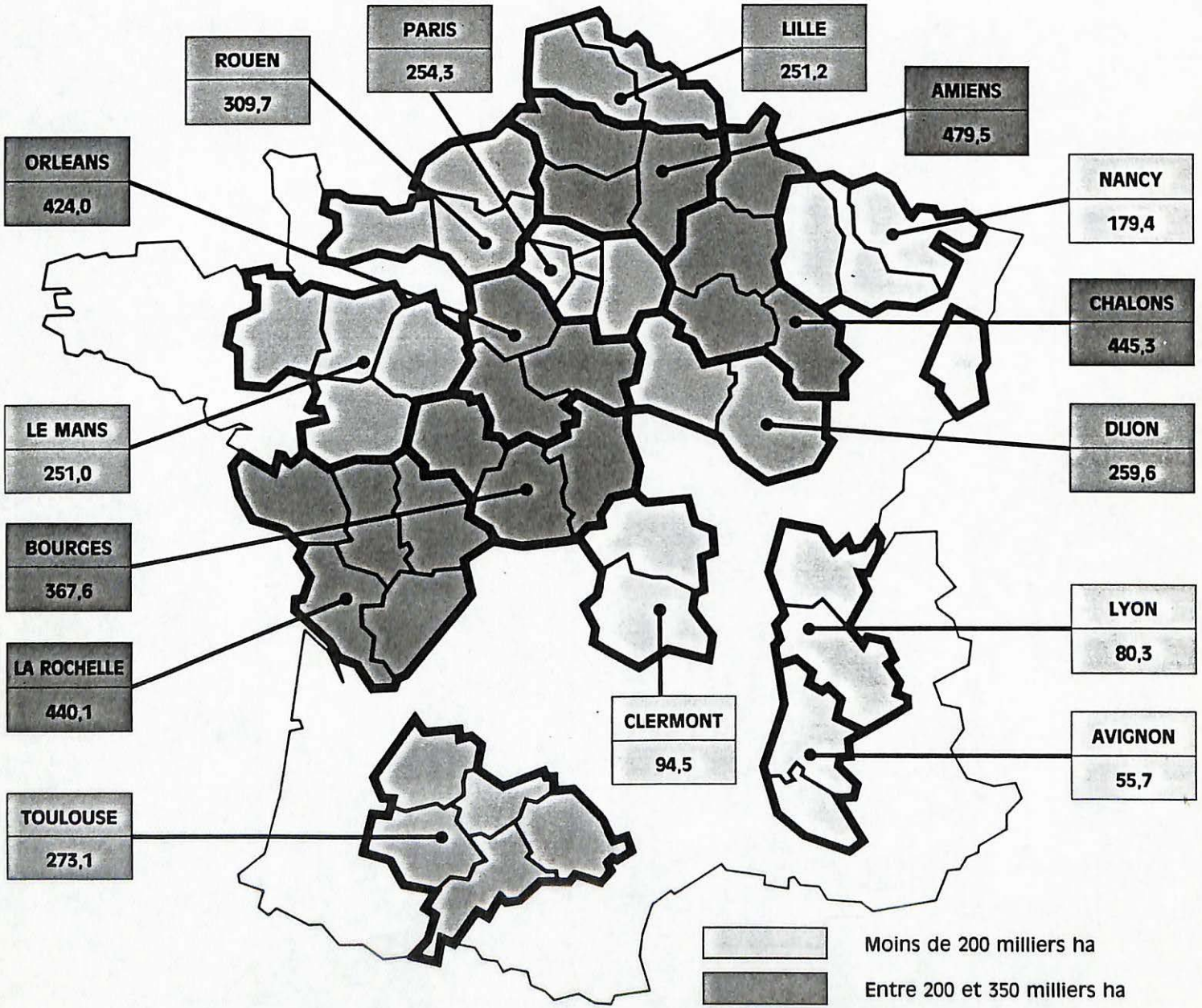
WHEAT - WORLD 1986

Country	Areas (%)	Yield (q/ha)	Production (MT) 1986	Production (MT) Prediction 1987
USSR	21.0	18.9	92.3	80.0
China	13.0	30.4	90.3	87.0
USA	10.0	23.1	56.9	57.3
India	10.0	20.3	46.9	46.0
EEC	7.0	45.6	72.0	71.7
(France)	(2.1)	(55.0)	(25.5)	(27.0)
Canada	6.0	22.4	31.4	26.3
Australia	5.0	14.8	16.1	12.8
Argentina	2.0	18.2	8.9	10.0
Others	26.0	-	120.6	116.6
Total	229*	23.4	535.4	508

(*) millions ha

LA PRODUCTION DE BLES DANS LES REGIONS
Superficies (en milliers ha)

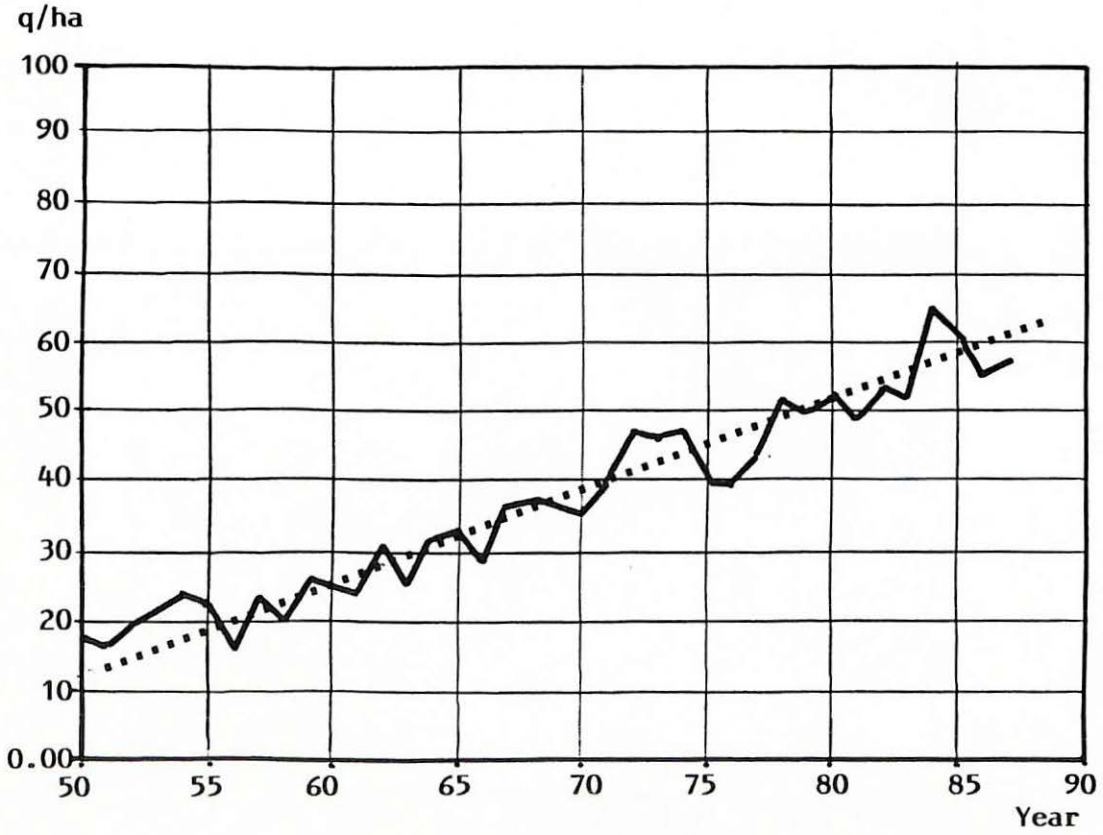


SOURCE : ENQUETE CEREALIERE PAR SONDAGE

AREA, YIELD, AND PRODUCTION OF WHEAT IN FRANCE, 1983-1987

	1983	1984	1985	1986	1987
Area (millions ha)	4.7	5.0	4.7	4.7	4.8
Yield (q/ha)	52	66	61	55	56
Production (millions t.)	24.4	32.7	28.5	25.5	27.0

PROGRESSION OF BREAD WHEAT YIELD IN FRANCE (1950-1990)
average : + 1,3 q/ha/year



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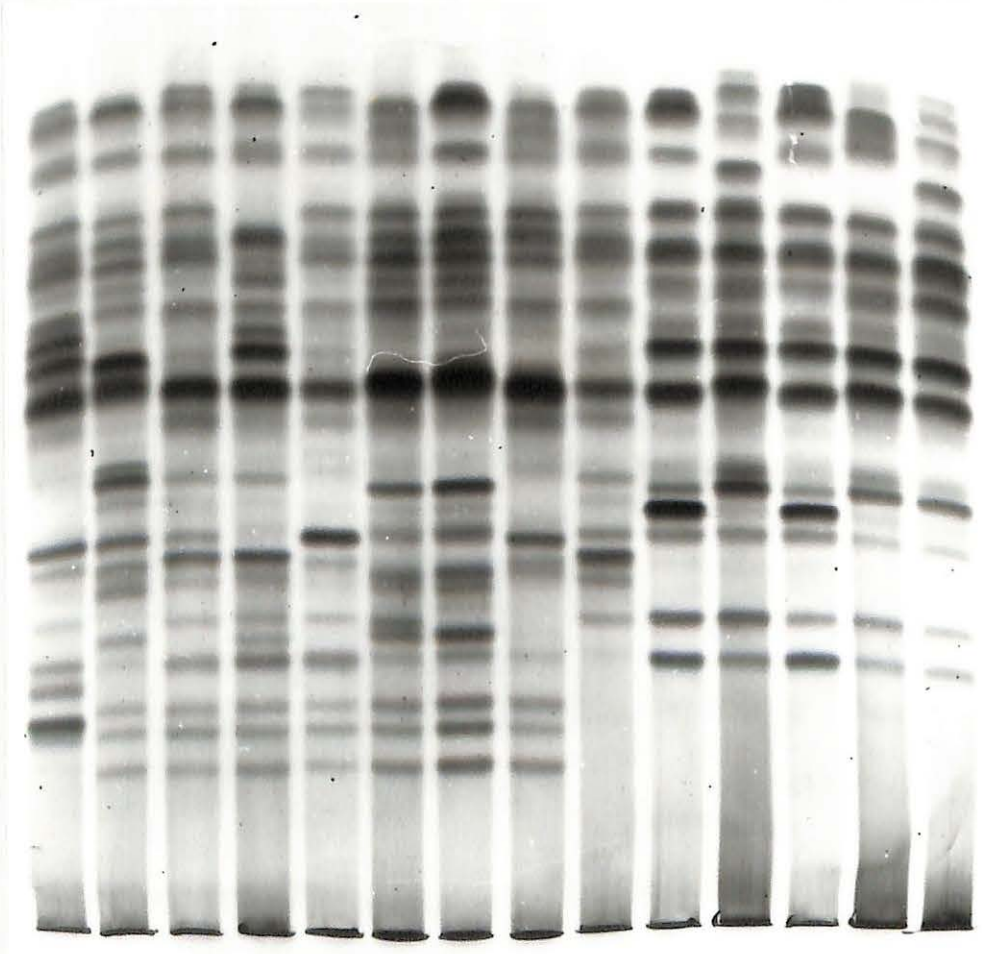
(7)



FRENCH EXPORTATIONS (1987/1988)

(8)

14 millions of tons are exported
(55-60 % of all collected wheats)

- 6.3 millions of tons --→ E.E.C. countries

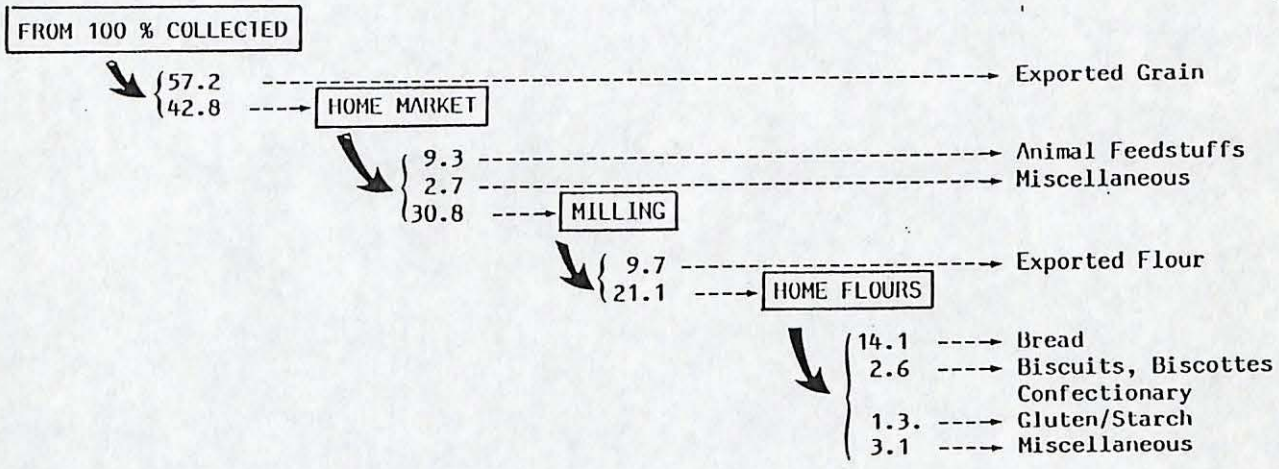
Italy	20.0 %	
Netherlands	5.4 %	
F.R. Germany	5.1 %	44.9 %
Belgium	5.0 %	
Others	9.4 %	

- 7.7 millions of tons --→ non E.E.C. countries

U.S.S.R.	27.8 %	
China	4.1 %	
Poland	2.3 %	55.1 %
Egypt	1.2 %	
Others	19.7 %	

SOFT WHEAT USES IN FRANCE (1987)

(9)



FLOUR HOME MARKET (1987)

(10)

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Confectionary Products	1.3 %
Vital Gluten/Starch	7.0 %
Miscellaneous	7.4 %

(11)

«Le blé, la farine, le pain»
CIFAP
66, rue la Boétie 75008 Paris

reproduction libre :
mentionner Photothèque Cifap

(12)

«Le blé, la farine, le pain»
CIFAP
66, rue la Boétie 75008 Paris

reproduction libre :
mentionner Photothèque Cifap

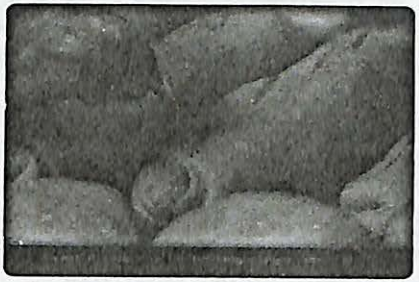
(13)

TYPICAL FRENCH BREAD FORMULA

Ingredients :	%
Flour	100
Water	60
Yeast	2.5
Salt	2
Fava bean flour	2
Ascorbic acid	0.005
Eventually :	
Malt	0.3
Lecithin	0.3

15

« Le blé, la farine, le pain »
CIFAP
66, rue la Boétie 75008 Paris



reproduction libre :
mentionner Photothèque Cifap

14

« Le blé, la farine, le pain »
CIFAP
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reproduction libre :
mentionner Photothèque Cifap

17

« Le blé, la farine, le pain »
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reproduction libre :
mentionner Photothèque Cifap

16

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reproduction libre :
mentionner Photothèque Cifap

reproduction libre :
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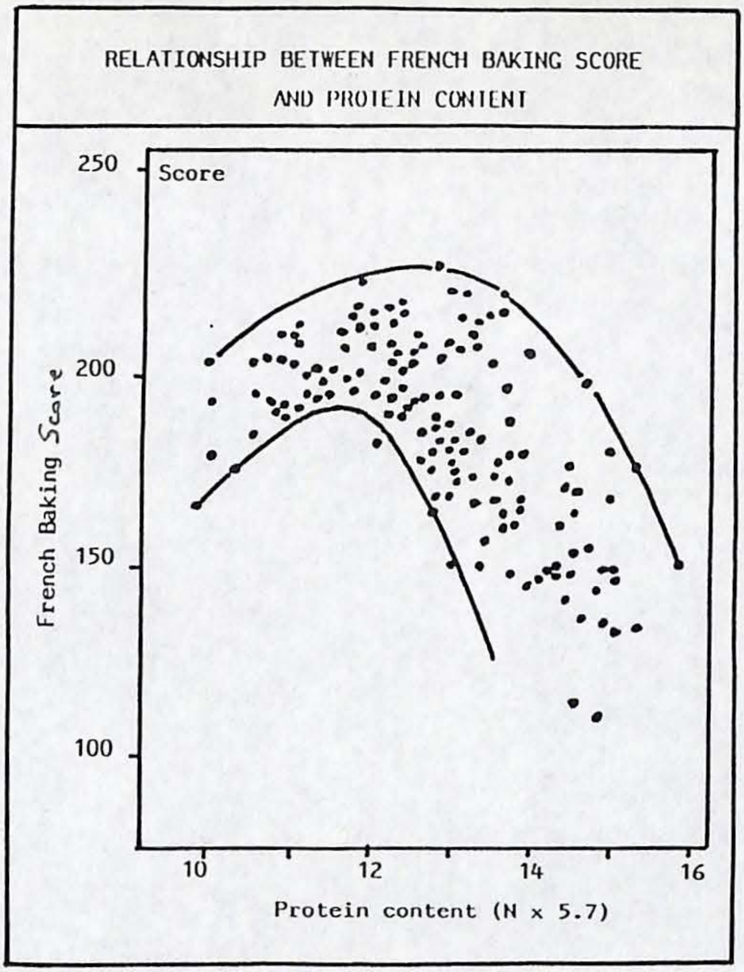
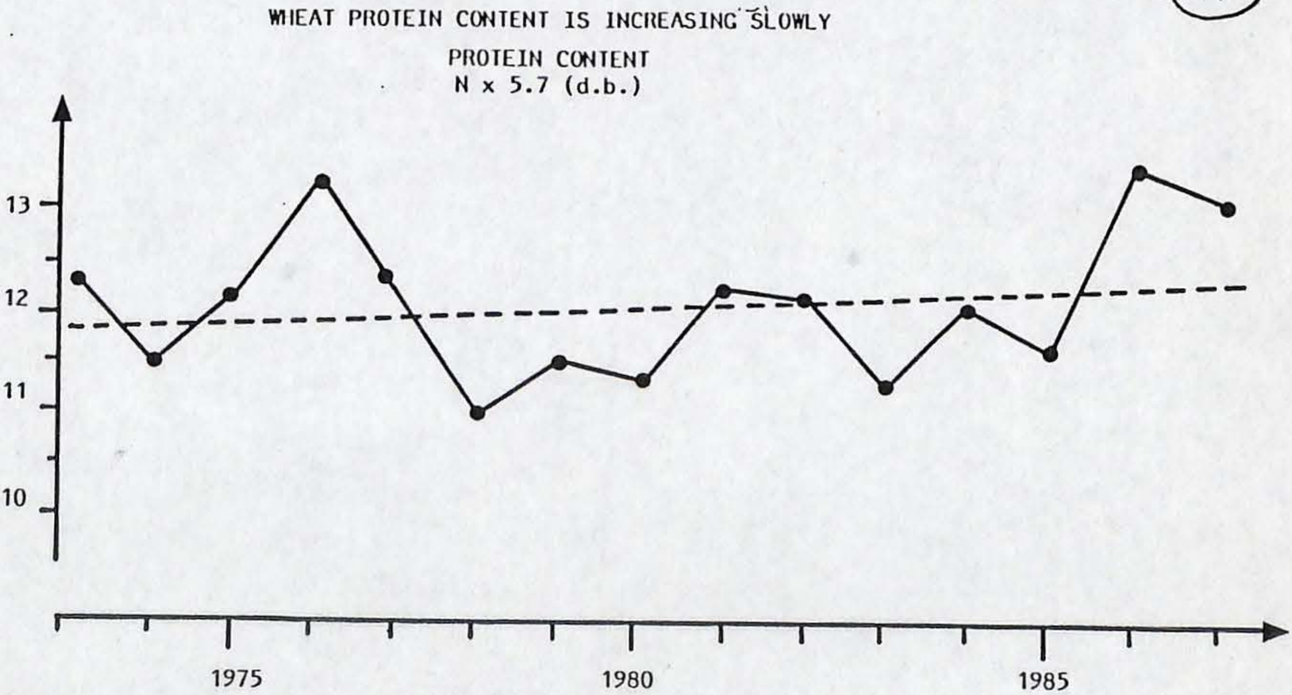
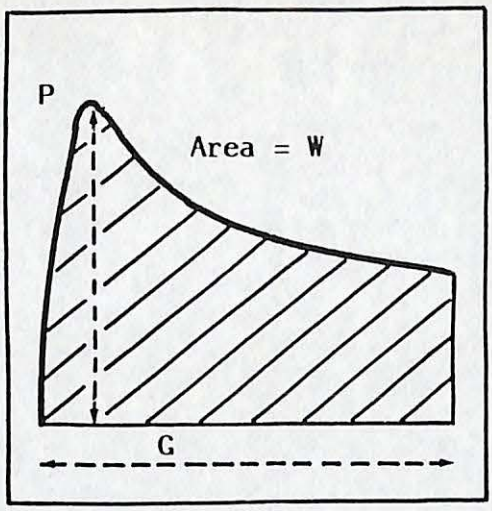
18


RELATIONSHIP BETWEEN FRENCH BAKING SCORE
AND PROTEIN CONTENT
250
Score
200
150
100
French Baking Score
10
12
14
16
Protein content (N x 5.7)

19


WHEAT PROTEIN CONTENT IS INCREASING SLOWLY
PROTEIN CONTENT
N x 5.7 (d.b.)
13
12
11
10
1975
1980
1985

Chopin Alveograh

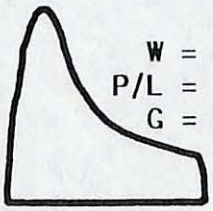


W = Baking Strength

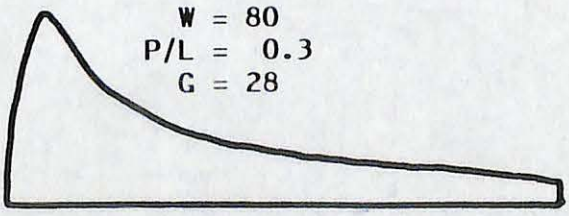
P = Pressure = Dough Elasticity

G = Inflation (Gonflement) = Dough Extensibility

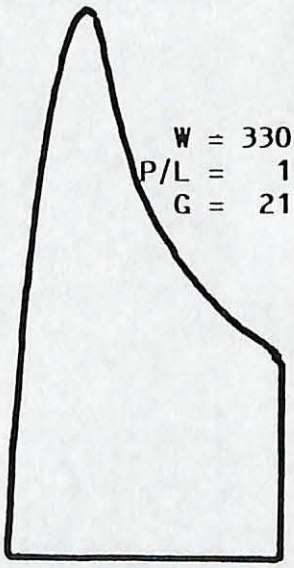
ALVEOGRAPH CURVES OF DIFFERENT WHEAT TYPES



Poor Quality Wheat



Biscuit-Type Wheat
Very Extensible Dough



Strong Wheat
Very Tough Dough

NEW TRENDS IN QUALITY REQUIREMENTS

For many years, the traditional French bread could be obtained from relatively weak flours (Alveograph W : 100-150)

The baking technologies of to-day (intensified kneading; cooling for controlling the spring of the dough; use of frozen dough) require stronger wheats ($W \geq 250$)

The rapid development of new specialty products (rolls, buns, fast-food breads, ...) now requires much stronger wheats ($W \geq 350$)

The increase of exportation also brought some specifications of higher strength and higher protein content than before

The millers can satisfy these demands by
- encouraging (bonus) the production of preferred cultivars
- adding vital gluten
- using mill streams or air-classified flours
- using very strong cultivars grown in Rhône Valley

QUALITY REQUIRED FOR REGISTRATION IN FRANCE

W Alveograph(*)	Baking Score	Protein content (*)	Class	Threshold of Yield (*)
190 %	special baking	-	A	no
90-190 %	Capitole	-	B1	98
	Capitole	-	B2	100
90 %	Talent	-	C1	105
	Talent	-	C2	108
-	unsuitable for baking	≥ 110	D1	105
		< 110	D2	108

(*) in % of the standard cv. Capitole

(24)

BAKING STRENGTH HAS DOUBLED IN THIRTY YEARS

Registration Year	Major Cultivar	W Alveograph
1933	Vilmorin 27	90-100
1946	Cappelle	120-130
1950	Etoile de Choisy	60-70
1959	Champlein	80-90
1964	Capitole	140-150
1969	Hardi	160
1973	Talent	130
1973	Maris Huntsman	70
1977	Arminda	120
1978	Fidel	140
1980	Campp Rémy	180-200
1981	Festival	170-180
1984	Moulin	180
1986	Thésée	180
1986	Récital	220-240

(25)

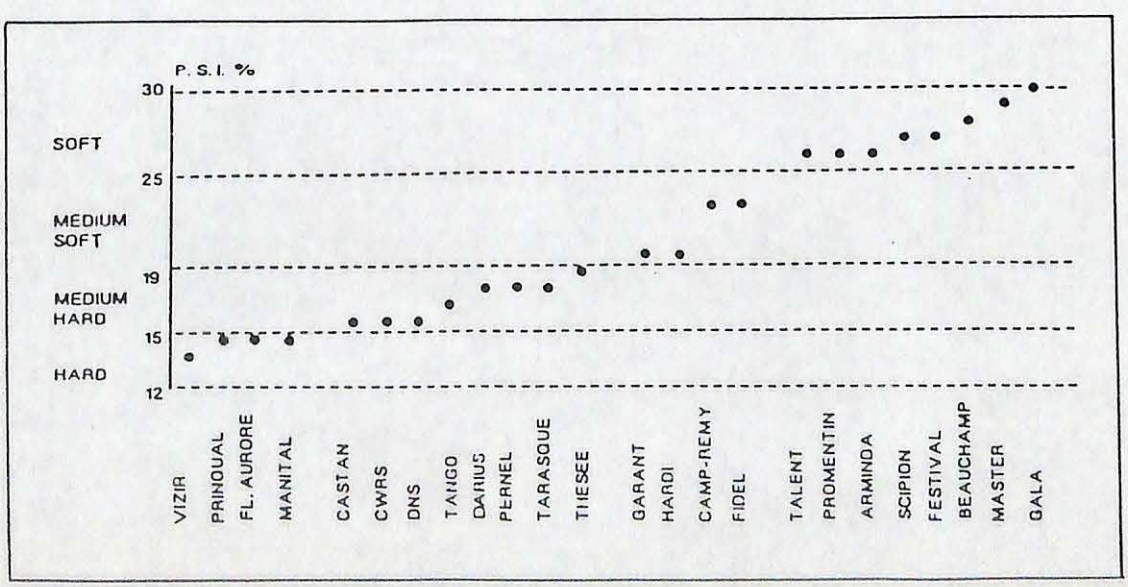
LEADING BREAD WHEAT CULTIVARS IN FRANCE (1987)

Cultivar	Quality Class	W Score (1-9)	Baking Score (1-9)	Area (millions ha)	%	
Festival*	B2	6.5	5.5	0.81	17.3	→
Camp Rémy*	B1	6.5	6.5	0.54	11.4	→
Fidel	B2	5	6	0.50	10.6	↗
Arminda	C1	5	-	0.27	5.8	↗
Beauchamp	B2	4.5	5	0.27	5.8	→
Pernel*	B1	6	6.5	0.25	5.4	↘
Talent	B2	4.5	5	0.18	3.8	→
Hardi*	B1	7.5	7	0.14	2.9	→
Moulin*	B1	6.5	6	0.13	2.8	→

(*) Recommended by the milling industry

(26)

PARTICLE SIZE INDEX OF FRENCH WHEATS



BREAD WHEAT PRICES IN FRANCE
(SEPTEMBER 1988)

Standard prices

- for breadmaking ..... 126.1 F/q
- for animal feed ..... 119.8 F/q

Recommended Cultivars

- cvs Capitole, Camp Rémy
  or Castan ..... 133 F/q

Strong Wheats

- cv. Darius (Rhône Valley)..... 142 F/q
- cv. Aubaine (South-West) ..... 150 F/q
- cv. Prinqual (Rhône Valley)..... 180 F/q
- cv. Florence-Aurore (Rhône-Valley). 210 F/q

Imported Wheats

- Dark Northern Spring ..... 251 F/q
- Canadian Western Red Spring ..... 256 F/q

WHEAT AND MAIZE USES
FOR EUROPEAN STARCH INDUSTRY

	Wheat	Maize
1976/77	207	2 880
1977/78	309	3 820
1978/79	351	4 120
1979/80	344	4 010
1980/81	372	4 120
1981/82	384	3 890
1982/83	564	4 200
1983/84	792	4 180
1984/85	952	4 240
1985/86 (a)	1 294	4 357
1986/87 (b)	1 100	4 260

x 1000 tons

CONCLUSIONS

1 - Intensive wheat growing, very high yields, large regional differences in quality

2 - Importance of the variety concept for the millers (electrophoretic inspections)

3 - Specificity of the French breadmaking process and extensive use of Alveograph curve for quality specifications

4 - New breadmaking technologies (dough cooling or freezing)

5 - Regular increase of the level of baking strength required for standard French breadmaking

6 - Considerable increase of gluten production and uses

7 - Agricultural impacts of other industrial openings (ethanol) : still difficult to predict