EXPLORING DIVERSITY IN PAST AND PRESENT
(Written sources)

In many areas of research, the main problem is that written sources are few and far between. As far as plants are concerned, the problem may be that their number is overwhelming. Forty years ago, Uphof's *Dictionary of Economic Plants* (1968) provided a bibliography of about 1400 references. A few years later, S. Rehm and G. Espig listed exactly 1577 references in *Die Kultupflanzen der Tropen and Subtropen* (1976). But the number of references given in a book is necessarily limited by factors such as the point of view of the author, the languages he or she can read, the time he or she could spare for it, the constraints of the publisher, etc. The real number may be much larger, although nobody really knows. On useful plants in modern times since, say, the 17th century, the number of written sources must be in the order of several tens (if not hundreds) of thousands, in a score of different languages. No one, even after having spent a whole life on the matter (which would be impossible anyway), can be expected to have more than a very partial view on the whole matter.

One cause of this state of affairs is that the number of "useful" species is itself enormous. In *Les fondements biologiques de la géographie humaine*, published in 1943, Max Sorre quotes figures in the order of 2700 to 2900 edible species. The number of species mentioned in *Die Kulturpflanzen...* is still in the order of 2500. The total number of "economic" plants that have an entry in the *Dictionary* of Uphof is about 10000. The most recent evaluation I was provided with (Chauvet 2009) is between 7 and 8000 cultivated plants, and between 20 and 30000 useful plants. But this is only a "reasonable" estimate. Depending on the number of species each author identifies within the same genus, and on what is thought to make a species to be counted as useful, real estimates may be much higher; there is one approaching 90000 species. To cope with the problem, one immediately thinks of data banks. But even data banks might not be a miracle solution. More than 30 of them have been recorded by Chauvet, some of general use, some restricted to one continent, one country or one category of plants, etc. So that exploring data banks could soon become a full-time business too.

Are these remarks relevant here? Frankly, I do not know. The only point I want to make is that, whatever the plant we are interested in, there are probably more written sources about it than we can imagine. The best example I can think of is that of a tinctorial plant named in French *maurelle* or *tournesol* (*Croton tinctorius* L., *Chrozophora tinctoria* A. Juss., nothing to do with the sunflower). This was a wild plant, gathered by the inhabitants of Grand-Gallargues (halfway between Nîmes and Montpellier) within an area extending two to three hundred kilometres east and west of their village. Once brought in at home, the plants were crushed and pressed, their juice was put to imbibe clothes (locally *drapeaux*) which after drying were finally laid out on fresh manure heaps. When they had thus acquired the desired blue colour, the *drapeaux* were sent to Holland where the blue dye was extracted and used, mainly in confectionery. Some authors assert that the business was already attested in the 15th century. It went on without important changes (or so it seems) until the 1830s, when, because the wild grounds where the *maurelle* grew naturally became scarce, some plant growers began to put it into cultivation – which was of little use anyway, since it was soon to be made obsolete by the development of synthetic dyes.

This is only the summary of a short note I have written recently (Sigaut 2007), after having found by chance a few 19th century written sources on the subject. I had no time to go any further, but as usual, the sources I had access to were conducive to others. And although I cannot propose any definite number, I am pretty sure that if a complete research could be done on this rather unimportant plant, the number of written sources would be found in the order of several hundreds, in at least three languages (Latin, French, Dutch). This is another way, more concrete than data banks hopefully, to pose the problem of written sources.

I have just said that the *maurelle* was an unimportant plant. From an economic point of view, this is undeniable. The inhabitants of Grand-Gallargues were never more than one or two thousand, they did not all make their living by it, and even if we add the merchants who carried the *drapeaux* to Holland and the workers who extracted and used the dye there, the grand total of people concerned must never have exceeded, say, four to five thousand. On an European scale, this is negligible. But it is not uninteresting. For here is a plant that was always gathered wild for centuries, although it was the object of a regular commerce and of a sophisticated industry. The *maurelle* does not fit into our nice but artificial categories. As I see it, the true question is: how many such unimportant plants were there, which are practically never heard of nowadays? And if they look unimportant taken one by one, are they still unimportant taken all together?

If we turn to oil-plants, the question is about the same, only on a still larger scale. For most plants produce seeds, and most seeds contain a certain percentage of oil, so that most plants can be oil-producing, at least virtually. In fact, what makes a plant oil-producing or not is, 1° the facility/difficulty to extract its oil, which is a matter of implements and techniques, and 2° the uses to which this oil can be put. Both are rather complex matters, on which there is an extensive literature. But what I know of this literature has been found by chance (exactly like in the *maurelle* case), not by consulting bibliographies or data banks. A book such as *Fabrication et raffinage des huiles végétales – Manuel à l'usage des fabricants, raffineurs, courtiers et négociants en huiles*, by J. Fritsch (Paris, H. Desforges, 1905, xv-593 p.), although by all accounts totally obsolete, is the best introduction into the matter I have been able to find. It deals mainly with the techniques for extracting and refining oils, but it also records more than 120 species of oil-producing plants of economic importance all over the world. This is only one example among many: books like this one also exist in most European languages (some of them being quoted by Fritsch himself).

The Fritsch handbook was written at a time when the commerce of such products was flourishing on a world-wide scale, with the consequence that the local production of vegetable oils in "developed" countries was at a minimum. But there were times when the situation was reversed. During World War II, for instance, France was cut off from foreign countries, so that the government made efforts to revive the production of oil from old-fashioned sources such as beechnuts, horse-chestnuts, pumpkin seeds, grape seeds, etc. In fact, oil had been extracted from some of such plants for ages, but only in particular areas, and it took the constraints of scarcity to make them an object of serious attention again. A booklet like *Les plantes à huile*, by M. Jouven (Paris, Éd. de Montsouris, 1942, 160 p.) is a pretty good example of this "scarcity literature". Similarly, a number of pamphlets enhancing the production of oil from indigenous plants were published during the French Revolution, in the 1790s, when political events caused exceptionally long scarcities. Since all European countries have had their own times of scarcity, it is to be guessed that they have had also the attendant literature.

In the last decades, most written sources have come from ethnologists or museum keepers. One of the best examples I know of is *Tradycyjne olejarstwo w Polsce*, by Henryk Olszański (Sanok 1989, Muzeum Budownictwa Ludowego). It is in this book that I found a very important detail, namely that the seeds of weeds, resulting from the winnowing and sieving of the main cereals, were usually carried to the oil mill. It would be quite interesting to check whether this practice was in use in countries other than Poland.

Many other remarks could be made. As a conclusion, the two points I want to stress are, 1° that as far as the uses of plants are concerned, the main problem is that the number of written sources is huge, 2° so huge in fact that I have doubts on the usefulness of extant bibliographies and data banks. For the time being at least, it may still be more expedient to rely on flair and chance to find one's way into the mass of relevant literature.

REFERENCES

Chauvet, Michel (2009), Note sur les systèmes d'information sur les plantes utiles (unpublished paper, 9 p.).

Sigaut, François (2007), Quelques mots sur le tournesol, *in* A. Durand (ed.), *Plantes exploitées Plantes cultivées*, Aix-en-provence, Publications de l'Université de Provence, pp. 171-177.

François Sigaut — Le 10 juillet 2009

CROPS AND AGRICULTURAL DEVELOPMENTS IN WESTERN EUROPE

One of the problems we meet when we are discussing "agriculture" today is that in the last 150 years, our idea of what the word means has changed beyond recognition. The term "agricultural revolution" has been put to much too many uses (and misuses). But what resulted from the development of machines, fertilizers, genetically selected crops and pesticides in Europe and North America from the middle of the 19th century on can properly be named a revolution. Yields have increased about ten times, and labour productivity by a factor 100 to 1000, according to the task concerned. Nothing like that is recorded from any other period in the past. True, assessing yields for older times is a rather tricky business. But the orders of magnitude are pretty well known. Figures given by Roman agricultural writers in the two last centuries B.C. are not very different from those known from 18th century sources, so it would be possible to assume that nothing really important did happen in between. Of course, it is not quite true. There were many changes. But there were also many things that did not change. The main difficulty is to draw a fair pictures of both, never forgetting that non-changes may be as significant and important as changes.

One of the things that did not change much was the reliance of people on cereals for food. A large number of famine plants were known and consumed in times of scarcity. But in normal times, cereals provided the main food of nearly everybody. Of course, there were some differences between regions, especially according to the greater or lesser importance of animal husbandry in the area. But as a rule, only the very rich could afford a diet that was based on something else than cereals – on meat mainly, with an emphasis on poultry and game. The main exception is that of chestnuts. In some areas of central and southern France and Italy, chestnuts became the staple food of peasants from the 15th to the 19th century (Pitte 1986). It is difficult to tell whether this reliance on chestnuts was a quite new thing or only the development of earlier, less specialized practices. Chestnuts, like acorns (especially the so-called *glands doux* or "soft acorns", without tannins, well known in Spain and in some areas of southern France and Italy) may have been formerly used either as famine foods or as snacks for shepherds, travellers, outlaws, etc. What is not fully understood is how and why chestnuts became a staple as late as they did, and in some areas only.

Granted, people never lived by bread alone, but bread (in its broader sense, including all other cereal foods that are not technically "bread") was for them a matter of life or death. The failure of other crops could be a more or less serious nuisance. The failure of corn (the word everywhere means the most important cereal, be it wheat, rye, oats, etc.) meant famine. And famines were an irregular, but frequent occurrence; they came back at least once every 5 to 10 years. Again, there were exceptions. Maritime areas, like the Netherlands or England, were up to a point insured against famines, inasmuch as they occupied strategic positions in the international trade of grain, which went on along seacoasts and rivers. But in most landlocked areas, famines or at least severe food scarcities remained a fact of life until as late as the years 1860 to 1880. This situation, which could be called Malthusian, was one of the things that probably did not change much between the Neolithic and the 19th century.

Among the things that did not change much, at least since the coming of iron, is also the tool-kit. We know very little on Neolithic agricultural tools anyway, and nothing at all, so to speak, on tillage tools (if any). By the Final Neolithic and the Bronze Age, our knowledge improves somewhat, but not enough to provide us with any clear idea of how people really tilled their fields, planted, weeded and harvested their crops, etc. Only with the coming of iron

does this state of affairs begin do improve, for two main reasons. First, there are more and better data. And second, these data are more likely to be rightly interpreted, because ancient iron tools are (with proper caution) comparable to modern ones.

Of course, "comparable" does not mean "similar". But iron tools, ancient and recent, have much in common. This is not to say that once iron is there, changes become insignificant. Quite the contrary. The seemingly infinite diversity of agricultural tools and implements to be seen in any local museum today is obviously the result of a similarly infinite number of local innovations, the importance of which should not be underestimated. For they are our only means to understand how cultivation techniques were more and more finely tuned to local conditions. But on the other hand, the existence and performance of most tools depends on one main factor: the availability of good quality metal – iron and steel. Archaeologists date the Iron Age from the 12th or 11th century B.C. But what is relevant for us would be to know when iron became cheap and abundant enough to be used in the manufacture of tools, not only of weapons or luxury objects. The exact date may be assumed to differ somewhat from one area to the other. On the whole, it can be assumed that this stage was everywhere reached by the 5th century B.C. From that time on, European peasants were in possession, not of a complete tool-kit, but of the means to develop it according to local needs and circumstances.

One of the most important of these development was that of the scythe. Iron blades more or less like scythe blades have been found in late La Tène sites (2nd century B.C.) in Switzerland, but it is not known with any certainty what they were used for, nor how they were handled. Some of them may have been used for harvesting hay already, but which ones and what were the uses of the others? We just do not know. The language of the Roman writers provides a pretty good image of the situation. The word *falx* meant any incurved cutting implement or weapon. There were about a dozen of different *falces*, some of which were sickles (*falces mesorias*), others billhooks (*falces arborarias*), etc. There were also *falces fenarias*, used to harvest hay, which can reasonably be called scythes, but they were not similar to the modern ones. Plinius wrote that they were handled with one hand only in Italy, with two hands in Gaul, and this is the only evidence we have of the way they were wielded. Neither the tools themselves, nor the iconography give us better clues. "True" scythes, looking so much like modern ones that their interpretation cannot reasonably be disputed, have been found in the lower Rhine valley and dated from the 7th or 8th century A.D. (Henning 1991). It took of course some time for them to diffuse outwards. For example, scythes only reach Ireland in the 13th century, introduced by the first Anglo-Norman conquerors (Kelly 1998). But as concerns the tool itself, there are only three major dates: the 2nd century B.C. when it makes its first appearance, the 7th century A.D. when it reaches its definite, modern form, and the 20th century when it is replaced by machines. These three dates provide a good idea of the kind of time scale that is needed for understanding agricultural history.

Scythes are important under at least three respects: craftsmanship, animal husbandry, and landscape. Craftsmanship: scythes are a masterpiece of pre-industrial metallurgy – a point that cannot be further discussed here. Animal husbandry: scythes mean hay and hay storage, which is a solution for one of the most acute problems of keeping animals in countries with harsh and long winters. And landscape: scythes mean meadows, that is a part of the landscape put aside for grass to be mown. Most (if not all) European languages have a special word for it (Engl. *meadow*, Germ. *Wiese*, Fr. *pré* and *prairie*, etc.), not to be confused with grazing areas (*pasture, Weide, pâture* or *pâtis*, etc.). Meadows are also grazed after the hay harvest, but so are all other fields after their main crop has been taken off. It could be said indeed that meadows are fields too, with the only difference that their crops are not sown. It is not usual

to consider meadow-grasses as cultivated plants, but in a sense, they should. For it is obvious that after a few years of regular mowing, the set of plants growing in the meadow is not "wild" any more. This is only one more case where drawing a line between wild and cultivated plants does not make much sense.

The scythe appears to be the last great innovation of what could be called the European Iron Age agriculture. With it, the tool-kit of European peasants is virtually complete. As already said, it does not mean that there won't be any further innovations, quite the contrary. But these will be adaptations to local conditions and needs. In France for example, vineyards were usually tilled by hand, with hoes, with the result that local museums show a bewildering diversity of hoes – an implement nearly unknown in Britain. Local innovations are to be found everywhere, except of course where they are not needed. Each country, each province, each village perhaps developed its own tool-kit according to its needs and possibilities. And the same is certainly true for ploughs, carts and wagons and all other farm implements. But by the late Roman times or early Middle Ages, the basic models are there. They are the result of the availability of iron which was obtained in the preceding centuries. And notwithstanding their many further developments, they will be there until the advent of machines in the 19th century. That makes a grand total of about two millennia during which permanencies (no-changes) were at least as important as changes.

Let's go back to cereals. In prehistoric Europe, the only grown cereals belonged to the genera *Hordeum* and *Triticum* (leaving aside the millets for the moment). By the 10th century A.D., two more species had been added to the list: rye (*Secale cereale*) and oats (*Avena sativa*), and they had reached about the same level of importance as wheat and barley. The paradox is that we know nearly nothing about when, where, how and why this did happen. For the Roman agricultural writers, rye and oats (if mentioned) were little else than weeds. And the idea that they were indeed weeds which had been slowly put into cultivation is an old one. The trouble is that this idea explains nothing. People had ignored rye and oats for millennia, why should they have suddenly put them in cultivation toward the first century B.C. or A.D. ? The sad fact is that not only we lack the answers, but we also lack the questions, inasmuch as nobody seems to have really bothered to ask. In comparison with the enormous mass of literature on the domestication of cereals in the early Neolithic, the literature on the domestication of rye and oats seems practically inexistent.

If we consider the chronology, we can hypothesize that the domestication of rye and oats must have some relations with the advent of the iron-age tool-kit discussed above. But what could those relations have been ?

Let's have a look on the case of oats. Until the 19th century and with few local exceptions, cereals were reaped (that is, cut with sickles, handful after handful), never mown (with scythes). But spring oats (not winter oats, which are another case) were mown, not reaped, and this peculiarity is attested from Carolingian times. So it is not unreasonable to suppose that the growing of oats (as feed for horses mainly) may have something to do with the diffusion of the scythe.

But why should spring oats have been mown, and not the other cereals ? A part of the answer could be that in most of Europe, oats were grown for feeding horses rather than humans: they were less valued than the main cereals and their harvest had to be dispatched as quickly as possible not to interfere with the "true" harvest of these. But another part the answer may be that spring oats were sown in March, after only one ploughing which was done flat, the seeds being buried by harrowing. Whereas other cereals were sown after several ploughings, usually ridge-and-furrow, the last of which was intended both to finish the ridges and to bury the seeds. Now, a prerequisite for the regular use of scythes is that the ground be made as flat as possible. Here, it is the plough which comes into the picture. Flat ploughing

for oats required a plough (a "true" plough, with a wide and flat share, a coulter and a mouldboard), not an ard. So it is quite possible that the development of the plough and that of the scythe had both something to do with the cultivation of oats.

The case of rye is much less clear. The ploughing and harvesting techniques for rye do not seem to have differed significantly from those used for wheat – the less so since both were often sown together (*maslin*, *méteil*, *Mengkorn*...). Rye can produce crops in soils that are unfit for wheat, but this remark is of little use to explain when and why it was put into cultivation. The only possible hypothesis for the moment comes from a rarely observed fact, that I would propose to call "the rye exception". As far as it is known to me, rye was never prepared into anything other than bread proper (and beer, but rather infrequently), whereas all other cereals can be accommodated into a large number of products other than bread (porridge being one among many). If to be made eatable rye had to be made into bread, and bread only, it leads to the hypothesis that its domestication was made possible by the diffusion into northern Europe of Mediterranean bread-making techniques, and especially of the closed bread oven which seems to have been a Roman innovation.

Once again, it should be stressed that our purpose is not to give answers but to ask questions. The rapid expansion of rye and oats in the first centuries A.D. has to be explained. The only chance we have to find explanations is to ask as many questions as possible. This is what we have tried to do here.

After rye and oats, the only cereals that were introduced into European agricultures were rice, buckwheat, and maize, in that order.

Rice was already known in Europe in Roman times, but it never became important, except in some very limited areas of Italy and Spain.

Buckwheat was of first rank importance in Asia and in eastern Europe (Russia, Poland, etc.). It only reached Western Europe toward the end of the Middle Ages, via the Baltic countries. In northern Germany, Denmark and the Netherlands, buckwheat was found to thrive on the paring and burning of moors and peat-bogs, which were very extensive and until then completely unproductive. (By the way, let us not forget that paring and burning is a technique that requires hoes or spades with very strong and sharp iron blades.). In France, where moors and peat-bogs were much less extensive, buckwheat was grown in other conditions, either in very poor soils like the chalky wastes of the "Champagne pouilleuse", or as a substitution for a fallow (that is, the several ploughings before a crop of rye) in Brittany.

The history of maize is pretty well known, since it was brought back from America by none other that Cristobal Colon himself. But it seems to have taken some time, between one and two centuries, for maize to become really important anywhere. For the most part, maize found its place in areas with hot and wet summers, where it superseded millet. Unfortunately, we do not really know how the replacement process went on, one of the reason being that millet itself is poorly documented in written sources.

There are a lot of difficulties with millet. The word itself is misleading because in current English, it refers to any one of nearly twenty cereal species that have little in common, except to be more extensively grown in hot climates than in Europe. In ancient times, the name *millet* was restricted to the "true" millet, *Panicum miliaceum* (lat. *milium*, esp. *mijo*, fr. *mil, millet*, ital. *miglio*, germ. *Hirse*, etc.), whereas the other species of European importance, *Setaria italica*, had a quite different name (lat. *panicum*, fr. *panis*, ital. *panico*, germ. *Pfenig*...). One cause of the modern confusion is obvious: both species were practically unknown in Britain. Which is also a plausible explanation why most economic historians, following the British lead, have always considered millets as negligible. There is another plausible explanation: in many cases, peasants grew millet by hand, as a snatch-crop and for

their own consumption only, so that it was not recorded in written documents. But this second explanation is not quite convincing, for there are many other cases where millets (either *Panicum* or *Setaria* or both) were really important and remained so even after the coming of maize, well into the 19th century (Hörandner 1995). The problem of millets may be said to be the reverse of the problem of rye or oats. We know that rye and oats became of first rank importance in the first centuries of our era, but we do not know why. As for millets, we know they were always there, but we do not know whether they were important or not.

The case of millets is probably not unique. A similar story could perhaps be told about tuber plants, with the triumph of the potato in the 19th century pushing the traditional uses of roots and tubers (beets, carrots, parsnips, turnips, etc.) into oblivion. Some of them found new uses as fodder or industrial plants (turnips, sugar-beets...). But their significance and importance in older times has been often lost and is accordingly to be rediscovered.

Some plants pose a question of another kind: what is the difference between the regular use of a plant and its cultivation (or domestication)? This is the question we have already asked about meadow grasses. Another example is that of furze or gorse (*Ulex europaeus*). In many regions of Atlantic Europe, from Northwest Spain to the British Isles, furze was a first rank fodder plant. The problem was to get rid of its spines, which prevent animals eating it in its natural state. The solution was to crush the plant in a mortar or a handmill before feeding it to animals. This developed into a regular practice in Brittany since at least the 17th century, for the feeding of young horses that were one of the main riches of the country as an export produce. Was furze cultivated, *i.e.* sown in fields regularly ploughed, etc.? It was sometimes, but not always, all depending on local circumstances and opportunities. And as far as is known, there were no significant biological differences between "wild" and "cultivated" furzes; both remained spiny enough to require crushing before being fed to animals.

The Spanish broom (*Spartium junceum*), is often confused with furze. However, the plant has a different geographical area, and more uses: for fodder too, but also for basketry, for textile and even perfumes. A recent study (Olivier 2005) has shown how important Spanish broom was in a small region of southern France (around Lodève, Languedoc); but it also reminded us that Spanish broom was important in other areas of Spain and Italy. What furze and Spanish broom have in common is that both plants were sown or not, according to local circumstances, and that there are no visible differences between sown and "wild" plants. With the consequence that their geographical area of use more or less coincides with their natural area of reproduction. Contrary to plants of world-wide distribution like wheat, barley, rice, maize, etc., furze and Spanish broom have not been carried by men beyond their natural habitat.

Spanish broom is a plant with many uses: it should always be keep in mind that this is the rule, not the exception. Flax, one of the oldest known domesticated plants, is a good example: it produces eatable grains, oil, and fibres, one of its peculiarities being that linseed oil is a regular food item in some countries (Germany for instance), whereas it is not regarded as eatable in others (France). Most cereals too had uses other than food, and these non-food uses, although they may look quite secondary, may have been decisive in the choice of some cereals against others. The main cereals (wheat, rice, barley, rye...) do produce useful kinds of straw (for fodder; thatching, mats, baskets, etc.), whereas the "millets" (including maize, sorghum, etc.) do not. This may have had an incidence on harvesting techniques: "straw cereals" (*céréales à paille* in French) are ordinarily harvested with a sickle, whereas millets are not. My hypothesis is that the sickle was not primarily an implement designed to harvest

just the grain, for there are a lot of other techniques for doing that (Sigaut 1991), but to harvest something that could be called "grain-with-the-straw".

The number of non-food plants, or of food plants with non-food uses, is enormous. My last remark will be that in many cases, the distinction edible/not edible applies, not to the parts of the plant, but to one of its products. This is typically the case of oil. As we have just seen, linseed oil is edible in some countries, not in others. But olive oil, now one of the most fashionable ingredients of modern cuisine, seems to have first been exclusively used for body ointments, long before being found to be edible: when and how did the discovery take place? In fact, oils (and animal fats) have always had a large number of different purposes, such as quenching hot steel, greasing axles, treating cloth, lighting lamps, etc. If we are to understand why one particular plant was important (or not) in this or that time/place, we have to ask questions about all the possible uses of all its possible products.

REFERENCES

Henning, J. (1991), "Fortleben und Weiterentwicklung Spätrömanischen Agrargeräte-traditionen in Nordgallien. Eine Mähsense der Merowingerzeit aus Kerkhoven (Belgien)", *Acta Archaeologica Lovaniensa*, 30: 49-59.

Hörandner, E., ed. (1995) *Millet-Hirse-Millet*, Bern, Peter Lang.

Kelly, F. (1998), *Early Irish Farming*, Dublin, Dublin Institute for Advanced Studies (p. 480).

Olivier, S. (2005), „Le genêt textile en Lodévois", *Histoire et Sociétés rurales*, 23 : 137-168.

Pitte, J.-R. (1986), *Terres de castanide, Hommes et paysages du châtaignier de l'Antiquité à nos jours*, Paris, Fayard.

Sigaut, F. (1991), « Les techniques de récolte des grains… », in M.-C. Cauvin (ed.), *Rites et rythmes agraires*, Lyon & Paris, De Boccard : 31-43.

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