François Sigaut

Swidden cultivation in Europe. A question for tropical anthropologists

Anthropologists working in tropical countries often look rather surprised when told that swidden cultivation was still practised in Europe as lately as 25 to 30 years ago. Indeed, the last swiddens were made in western Germany (Siegerland) in the early fifties of this century, and in one district of Austria (Breitenau, Styria), photographs could still be taken in swiddens in the early sixties (Fickeler, 1954; Reichmann, 1966, p. 338; Frühwald, 1966, p. 162). It is also quite likely that the last swiddens of northern Russia were made in the same period, that is in the 10-15 years after the end of World War II. Granted, the areas involved at the time were tiny, which goes some way toward explaining why they were so easily overlooked. But as a matter of fact, the terminal phase in the history of European swidden agriculture did not set in all that much earlier. By and large, the system still held its own in the 1870s, and its decline is doubtless connected with the massive imports of cereals from overseas, which wrought so much havoc on many branches of European agriculture in the 1880s and 1890s. So the question as to the causes of the anthropologists' lack of interest towards European swidden cultivation remains. But there is a second question, more relevant from our point of view here: what has anthropology missed by ignoring the European case — and what

Paper presented at the IXth International Congress of Anthropological and Ethnological Sciences Symposium on "Anthropology of Shifting Cultivation", Bhubaneswar, India, 19-24 Dec. 1978.

Social Science Information (SAGE, London and Beverly Hills), 18, 4/5 (1979), pp. 679-694

can be done about it; it is the aim of this paper to suggest tentative answers to these questions.

The first question need not detain us very long: the answers to it are too general and too many to be discussed here. Suffice it to say that the gap between European and Third-World anthropology remains as wide as ever. Increasing specialization, a development as necessary in anthropology as it is in all sciences, has not been compensated by a comparable improvement in the systems of communication. For example, the growing prevalence of English as the only working language in anthropology has evident advantages. But one of its drawbacks is that more and more anthropologists tend to rely more and more exclusively on English language sources for relevant information, with the result that domains where most of the relevant information has not been published in English are increasingly neglected: swidden cultivation is definitely one of them, in the case of Europe.

And now to our second question: how much has our understanding of swidden cultivation — and of swidden farmers — been impaired by neglect of the European case? Or to put it another way, what can we gain by including the latter in our overall picture? To give a complete answer to this question would suppose an intimate first hand knowledge of both the European and the tropical systems, which is beyond my grasp. Besides, if we have both excellent monographs (Conklin, 1957; Bernot, 1967) and compilations (Conklin, 1961, 1963; Spencer, 166) on tropical swidden systems, we have nothing of comparable value for temperate countries. So, what follows should be regarded as schematic and provisional working hypotheses at most.

To make this paper more easily readable, the material has been arranged under five headings: technology, ecology, economy, swidden agriculture as a system, and, last but not least, its future.

Technology

Slashing and burning. The European techniques do not appear to lie outside the range of variations observable in tropical countries. The two main differences are: a more specialized tool-kit — bill hooks of different shapes in place of the ubiquitous machete —

and, sometimes, more elaborate methods of spreading out the wood on the ground for drying and burning.

Fences. These seem to have been less important in Europe, owing to the lower density of wild animals, or to the tighter control of domestic ones.

Ground-clearance. In addition to slashing and burning proper, there is in many cases, in Europe, a further task of paring the ground with hoes, when the grass cover is important. The sods are left a few weeks to dry, put into heaps, burnt, and the ashes scattered. This process is not found in 'true' swidden systems, i.e. when the density of trees and length of time between subsequent croppings are sufficient to prevent the formation of a turf. Paring and burning is very hard work, however, even with the most adequate tools (the quality of the tools, and especially of the steel of the blade's cutting part, can make a big difference). It is much more backbreaking than cutting down trees, which is why the preservation of an adequate tree cover is so important for the perpetuation of the system. Paring and burning seems to be infrequent in tropical countries (Portères, 1972); it seems to be quite unknown in tropical swiddens.

Sowing. Broadcast sowing, rather rare in tropical swiddens (as well as in tropical agricultures generally), is the rule in European swiddens. Even turnips, the only root-crop grown in European swiddesn (and that in some areas only: Finland and northern Russia) are sown broadcast, with special procedures for scattering the tiny seeds (Steensberg, 1955).

Burying the seeds. With broadcast sowing, efficient and fast methods for burying the seeds are a prerequisite. It can be done by hand, with hoes or rakes. More often, however, the seeds are buried with harrows or ards (ards = ploughs of symmetrical structure, with no coulter nor mouldboard) drawn by horses or oxen. Harrows and ards used in swiddens are very specialized implements, adapted to the very special conditions they have to work in (Steensberg, 1955; Sigaut, 1975). This very use of draught animals is one of the main differences between Europe and tropical countries, since in the latter, swiden farmers rarely own cattle and never use them for draught purposes.

Weeding, scaring the birds, etc. In contrast with tropical countries, such tasks seem rather unimportant in European swiddens.

Harvest. Harvesting techniques in swiddens are more or less the same as in the neighbouring permanent systems, except that the use of the more efficient tools (scythes, and of course machines) is impossible. In Siegerland, the use of scythes was forbidden in order not to damage the offshoots from the cut-down trees.

Transport. Transportation problems occur at nearly every step of evey agricultural production system. In swidden cultivation, where there is no fertilization the main problem is carrying the harvest. There are no important differences on this point between Europe and tropical countries.

Ecology

Basically, swidden agriculture is the agricultural use of a forest environment. All its main features are devised in answer to forest conditions. Indeed, the two main categories of swidden systems can be defined according to the way the forest is used and preserved. They are:

— pioneer systems, where the forest is used without regard for its future preservation (people will move away, or settle down and shift to permanent agriculture), and

— stable systems, where the forest is allowed to recover, its recovery being sometimes more or less cared for.

Both systems are known in Europe, as well as in tropical countries. But the second one only is of interest to us from an ecological point of view. It cannot be denied that in the long run, swidden agriculture tends to be destructive of the forest environment. So, stable systems cannot continue indefinitely unless people are strongly committed to the protection of their forests. The strength of this commitment, and the way it was enforced, are one of the most interesting features of some European swidden systems.

Localization of swidden agricultures. In Europe, stable systems were localized in areas characterized by acid soils, cold and wet climates, and mountainous terrain.

The link between soil acidity and the agricultural use of fire (in swiddens or otherwise) is especially marked since most European cereals prefer neutral-to-slightly alkaline soils, and since fire remained the only means to correct excess soil acidity until lime and alkaline fertilizers came into general use.

Effects of swiddening on spontaneous vegetation. They derive basically from, 1. the techniques of clearing the field, 2. the duration of the cropping period, 3. the degree of protection of the vegetation during its first years of regrowth, and 4. the duration of the period of recovery.

1. Fire not only allows the cropping of cereals in excessively acid soils: it also promotes the growth of certain trees in the same way, i.e. by correcting soil acidity and destroying the layer of raw organic matter which develops under cold and wet conditions. Indeed, the use of fire developed into a forestry technique in central Europe in the last century for renewing decaying forests or for planting new ones on old moorlands (Sigaut, 1975: 112 ff.). In the Ardennes, centuries of swiddening resulted in replacement of beeches and firs by the more useful oaks. Another cause of this replacement is that oaks shoot off more readily from their stocks or roots.

Fire seems also to have an effect on the germination and growth of an important group of plants in European swiddens, brooms and furze (*Genista* sp. and *Ulex* sp.). These plants were important for their production — fodder, thatch, litter, firewood — as well as for their ecological rôle. They fix nitrogen in their roots, provide some shade and protection to the young trees, and above all, their quick and thick growth prevents soil erosion during the first years after cropping, before the tree cover has had time to reform. It would be interesting to know whether a similar group of plants plays a similar role in tropical countries.

2. and 3. In Europe as elsewhere, the number of successive crops taken out of one swidden was small: two or three at most. In many instances, moreover, there were strong regulations forbidding the taking of more than one crop (generally rye). This was in order not to damage the first and most vigorous regrowth of the trees. In addition, the stumps had to be pared off in a way favouring the production of offshoots, and the use of scythes was forbidden, to prevent their being cut down again. Harvesting had to be done with sickles. And after the harvest, cattle were kept out for some years (4

to 6), until the new crop of trees was high and strong enough to bear the browsing.

4. The period of recovery was also submitted to strong regulations. Its length was 16 to 25 years, with an average of 20-21 years (Sigaut, 1975, p. 122).

The crops. In contrast with tropical countries, the number of plants grown in European swiddens was small. They were exclusively cereals, with the only exception of turnips in northeast Europe, and possibly, but quite infrequently, of potatoes.

In Mediterranean and southern areas, wheat was the main and often the only swidden crop. In the more northerly regions, rye replaced wheat. Buckwheat, being quick-growing, was sometimes sown in early summer a few months before rye, as a catch-crop. Beyond the northern limit of rye cultivation, in the extreme northeast of Russia, the main crop was barley, and beyond the altitudinal limit of rye, in western Germany, oats. Millet (*Panicum miliaceum*), probably most important in former times, had already nearly disappeared by the last century, with only rare exceptions such as the mountains of eastern Slovakia (Podolák, 1972).

Effects of swiddening on crops. In preindustrial contexts, these effects were mainly advantageous from an agronomic viewpoint. In addition to allowing the growth of crops where it would have been impossible otherwise, swiddening implied the following consequences:

— fertilization was unnecessary since the ashes served the purpose; nevertheless, the yield was in general far greater than on permanent fields in similar conditions;

— weeds were no problem, at least when there was no overcropping; indeed, one area of West Germany specialized in the production of rye seeds on pared and burnt land, because the grain harvested was free of weed seeds;

— pests were perhaps less of a problem than in permanent fields, although nothing sure is known on this matter;

— the quality of the produce (grain and straw) was often superior in the swiddens; the same is probably true in tropical countries: it is often said, for example, that swidden rice is superior in taste to rice grown in permanent irrigated fields.

For the future, it would be important to analyze such advantages in greater detail, in order to see which ones would remain true — and marketable — in industrializing countries.

Economy

There are a number of different 'yields' to be taken into account for the study of agricultural systems, each one with its proper significance. In many societies, people think mainly in terms of seed yield (number of tons harvested for one sown); in others, they will think rather in terms of surface yields (tons per hectare). The number of such ratios is considerable. In order to actually understand the economics of traditional agricultures, it would be necessary to list all these possible different ratios, and to assess the significance of each of them. To my knowledge, this work has not been done yet. But one of the more important kinds of yields in every society is clearly the quantity produced per unit of working time — although the yield per short unit of time (hour or day) has a quite different relevance from the yield per month or year.

The comparison of yields between swidden and permanent preindustrial agricultural systems often seems to be to the advantage of the first (Sigaut, 1975, pp. 150-155). What matters for the future, however, would be to assess the exact point where, in the process of industrialization, work in swiddens ceases to be competitive against rising salaries nearby. In the French Ardennes, this point was reached relatively late, around 1890. At least until 1880, the work in swiddens paid more than in neighbouring industries, although the area was by then one of the more industrially advanced in France.

Swidden cultivation as a system

In contrast with tropical countries, swidden cultivation in Europe (in western Europe at least), was not a system in isolation, but was tightly integrated into larger socio-economic systems. Culturally, swidden agriculturists did not differ from their neighbours in language, beliefs, customs, etc. To describe them as swidden agriculturists is even questionable, since in most cases, swidden cultivation was for them but one of several economic occupations,

such as wood-cutting, charcoal-making, mining or metallurgy, wood-working, gathering, etc., not to forget of course some permanent agriculture. Indeed, it seems to have been the rule rather than the exception in 19th century Europe that peasants had one or more jobs in addition to agriculutre — the concept itself of agriculture as a full-time occupation seems quite recent, and what is surprising about it is that it could be developed at all, in spite of the seasonal character of agricultural work.

So, one factor in the shaping of swidden cultivation systems was the way people allotted their time thoughout the year among alternative occupations, swidden cultivation being only one of them. Although important, this factor cannot be treated here at any length, if only because it is so poorly known. A second factor was the market. Of course, grain was kept for subsistence. But besides grain, the swiddens yielded a number of forest products for sale: wood, of course (not timber, but poles and firewood), charcoal, and above all bark. In Schwarzwald, Siegerland and Ardennes, tanbark from oaks was especially important for the nearby tanneries. Gathering could be locally important: in the Maures-and-Esterel region, in southern France, briar roots were dug up for making pipes. It is possible that the gathering of mushrooms, of herbs (medicinal and others), the trapping of game (especially small birds, a very sought-after delicacy in former times), etc., were of commercial significance here and there. In short, two kinds of products were obtained in swidden cultivation: products for subsistence (grain, straw, some of the wood, plus milk and meat from animals browsing in the woods), and products for sale (wood, charcoal, bark, some gathering products). It is more than probable that stable systems could not have survived for so long without both.

A third factor in the shaping of swidden systems is of course social organization. From its very nature, swidden agriculture demands a high degree of cooperation between members of the village community. Cooperation was indispensable for the enforcement of the regulations, without which the system could not remain viable for long. Most often, the land under swidden cultivation was communal property, and remained so until the system itself ended (it often remains so to this day, for instance in Siegerland, where the land belongs to *Hauberggenossenschaften*, litt. 'coppice-mount societies'). The *mir* of Slavic peoples, which so greatly attracted early Russian socialist writers, was certainly bound up with an economy based on swidden cultivation. Communal property

was of course the most straightforward way in which a community could assert its control over the economy. In this case, all decisions such as the choice of the piece of land to be cleared each year, its measurement and divison into plots, and the allotment of a portion of equal value to each member, were taken by the community itself, or by a body of delegates. In Siegerland for instance, the apportionment of parts followed elaborate rules to assure its random character (Kroll, 1936). In many cases, people could sell their rights to the portion allotted to them. On the other hand, when the land was privately owned, the landlord often auctioned the areas to be cleared, which could happen also when the land was owned by the state.

But the community's (or the landlord's, whoever he was) control was not restricted to allotting the land. As already mentioned several times, it was also effective in technical matters. In order to afford the highest degree of protection for the forest, there were regulations for the cutting down of trees, for the burning of wood and sods, for the burying of seeds, for the harvesting of grain, for the browsing of cattle, etc. It would be interesting to know more about the origins of these regulations. Were they devised by the people themselves, or were they imposed by some superior authority? Both are possible. What seems certain is that such rules could never have been enforced without active cooperation on the part of the people, which means that they could not have been altogether incompatible with their economic interests. This is clearly in contrast with most tropical countries, where colonial and post-colonial administrations, insomuch as they did not simply ignore the problem, aimed more at suppressing swidden cultivation than at managing it.[1]

To sum up, if we look upon swidden cultivation as a system, the more interesting differences between Europe and tropical countries might be the following:

— tighter integration into the surrounding socio-economic systems; far from destroying swidden agriculture, this integration probably helped it to adapt and survive much longer than would have been possible otherwise;

— owing to this long-term adaptation to and integration into very differing social environments, a wider range of solutions in the fields of land ownership and community organization;

— in some areas at least, a very detailed body of technical regulations aimed at ensuring the continuity, not only of the forest, but of

the way it was used and therefore of the people who used it (which does not mean the absence of any conflict, of course);
— and, last but not least, the probable existence of a wealth of written sources allowing us to follow all this up through several centuries, at least in some regions (western Germany for instance); it is questionable whether a comparable historical depth can be achieved anywhere else outside Europe, except in Japan (McEwan, 1956) and possibly a few neighbouring countries.[2]

Problems for the future

Insomuch as the concept of primitiveness still makes any sense at all, no anthropologist would now argue that swidden cultivation is primitive. On the face of it, however, the fact that swidden cultivation arouses such interest among anthropologists and so little among agricultural scientists, clearly denotes how strong the presumption of its primitiveness remains in the modern mind. In 1961, Conklin listed more than 1,200 references on swidden cultivation in the anthropological literature. By contrast, the two main works referred to in the agricultural literature are Greenland (1975) and Nye and Greenland (1960). This bias could well be the core of the problem for the future. It is self-evident that no resources will be wasted on research on a 'primitive' system. And since no system can long withstand the changing conditions of the modern world without research, the condemnation of swidden agriculture as primitive amounts to a self-fulfilling prophecy.

This is not to deny its dangers (arising from excessive demographic pressure), nor that it is eventually doomed to extinction (although nobody knows for sure what will happen in a few decades). But until the time comes for its natural extinction, i.e. until people freely prefer to abandon swidden cultivation for more profitable alternatives (as happened in Europe), any attempt to suppress it would be either futile or odious or both. No doubt a rapid growth of general productivity and income in the Third World would soon make swidden cultivation obsolete. As long as such growth is not achieved, however, swidden cultivation will be there, and the real problem will be to find ways to manage it, not to destroy it.

By managing swidden cultivation, however, it is not suggested

here that the administration or any body of civil servants should be the managers. Quite the contrary. The less they interfere the better. Traditional controls tend to break down against rising pressures, both from outside and from inside. The first job of the administration should be to entrust village communities with the necessary means to keep or regain an ability effectively to manage their production system in new ways. This is of course a political and legal problem, which I am in no position to discuss responsibly. All I can say is that, in my opinion, solving this problem is an absolute prerequisite.

The second task of the administration is technical and economical. Against the rising pressures already mentioned, productivity must be raised without further endangering the environment. How large is the margin for increased productivity in swidden agriculture? Owing to the virtual absence of relevant research, no one can tell for sure. What is certain is, that to be relevant, such research must build on the knowledge and skills of the people themselves — as indeed it largely did in the more developed countries. The biggest difficulty would probably be the fact that today research has developed a language and culture of its own, too remote from the language and culture of subsistence peasants to allow for easy mutual understanding. Here perhaps lies an important task for anthropologists.

Far from being detrimental to the environment, increasing of productivity may indeed be a prerequisite for its conservation. Low productivity means making little out of extant resources, so that in the face of increasing population pressure, it can only lead to increased deterioration of the environment. This point needs no further elaboration.

We are in no position here to go further into the specifics of agricultural research problems. The only hint I should like to add is that the margin for increased productivity in tropical swidden cultivation systems is probably broader than it ever was in Europe. The range of possible crops is much larger (in Europe it was restricted to cereals), and the climate permits faster vegetation recovery after cropping. Granted, there is a limiting factor in the correspondingly more rapid depletion of mineral resources in the soil; a limitation all the more severe as artificial fertilization is not usually considered practical in swidden agriculture. Indeed, fertilization feasibility first depends on transport facilities (like so many things that it is difficult not to see transport improvement as

a top priority in any develoment programme). But in swiddens proper there would be no point in adding fertilizers to the already abundant ashes. However, if we look at swidden systems as basically a two-crop rotation system, one crop of food or industrial plants, and the other of shrubs or trees, the idea of fertilizing the latter may not seem quite absurd. Indeed, such an idea was actually put into effect by European peasants some decades ago, although in a somewhat different context. In some areas of south-western France, there are specific pieces of land devoted to the production of furze for manure, called *touyas* (from *tuye*, a local name of furze). When commercial fertilizers first arrived into this region, the peasants used them, not on their crops directly, but on their *touyas*.

It is not suggested that such ideas are to be taken at their face value. What is suggested is that the lore of peasants' knowledge and skills is an indispensable basis for any relevant research aimed at increasing the productivity of their production systems.

Conclusion

Anthropology is a study in differences. Differences between human societies are what makes them amenable to rational analysis. It is somewhat illusory to believe that any one society could be scientifically studied by itself, as an isolated object. The most "objective" monograph is still to some degree, implicitly at least, a study in differences — the differences between the observed society and the observer's society. The history of anthropology makes it overwhelmingly clear that it took the immense differences between the so-called 'exotic' societies and the European ones for anthropological thought to develop in European minds.

And so it was that anthropology was for a long time considered as the study of 'exotic' peoples. This stage was necessary: there is no need for we Europeans to be ashamed of it. But we now need to go further. The first step, i.e. the emergence of anthropologists in significant numbers from the ranks of the 'exotic' peoples themselves, is well underway, albeit long overdue. From the very nature of anthropology, any enduring monopoly of a particular culture over anthropological thought cannot but lead to a dead end.

The first concern of the new Third World anthropologists was to do fieldwork in their own countries, in order to break the European monopoly there. What I would like to suggest here is that a second step may now be in order: that Third World anthropologists come to do fieldwork in Europe. In my opinion, this would be a way to open up really new perspectives in European anthropology.

Swidden cultivation would be an excellent subject for Third World anthropologists intending to do fieldwork in Europe. Its late disappearance makes it still possible to find old people with firsthand knowledge of it. The wealth of archives in some areas will help to give its study an historical perspective that is often lacking in tropical countries. As already said, there is no overall detailed study of swidden cultivation systems in Europe. The collaboration of Third World anthropologists in such a study would certainly help elicit new questions and new answers, useful for a better understanding of both European and tropical swidden cultivation systems.

Francois Sigaut (born 1940), Maître Assistant at the Ecole des Hautes Etudes en Sciences Sociales, Paris, is presently engaged in research on "the history of preindustrial agricultural techniques mainly in 18th-19th century Europe". he has published several articles and the two following books *L'agriculture et le feu* (1975), *Les réserves de grains à long terme* (1978), and co-edited with Marceau Gast *Les techniques de conservation des grains à long terme. Author's address:* Centre de Recherches Historiques, Ecole des Hautes Etudes en Sciences Sociales, 54 Bd. Raspail, 75270 Paris Cedex 06, France.

Notes

1. "The colonial governments — i.e. the colonial Dutch government in Indonesia — did not suppress swidden cultivation. The Dutch plantations in North Sumatra (Deli) did even adopt this system. The higher quality of Deli's tobacco is the best evidence of the efficiency of the ladang system. Only after the great timber companies began to cut down the forests did the postcolonial Indonesian government launch a campaign against the swidden cultivators living in the forests." (Comment to the author by J. B. Avé, Curator, Rijksmuseum voor Volkenkunde, Leiden, Netherlands.)

2. "In Japan, more has been published since 1965 than had been brought out in all previous years. The focus there has been on Japanese systems primarily, with some outstanding monographic treatments, but it has also included some works on other Asian and African regions (. . .) (There are) impressive recent Japanese studies of situations where swidden cultivation continues in a broad industrialized setting."

(Comment to the author by H. C. Conklin, Prof. of Anthropology, Yale University, USA.)

References

In addition to works specifically referred to in the text, the following have been instrumental in the writing of this paper: Aurora et al. (1976-1977), Boulbet (1966), Dreyfus-Gamelon (forthcoming) and Wilken (1977). We are wholly responsible, however, for the opinions expressed in this paper, as well as for errors and omissions. Any European material put forth without specific references is taken from Sigaut (1975).

Aurora, G. S. et al.
1976-1977 *Socio-economic impact of shifting cultivation control schemes in North Eastern region.* Shilling, North Eastern Hill University, Department of Sociology and Anthropology. (Mimeo.)

Bernot, L.
1967 *Les paysans arakanais du Pakistan Oriental.* Paris/The Hague, Mouton.

Boublet, J.
1966 "Le miir, culture itinérante avec jachère forestière en pays Maa', région de Blao, bassin du fleuve Daa' Döông (Dông Nai)", *Bulletin de l'Ecole Francaise d'Extrême Orient* 53(1): 77-98.

Conklin, H. C.
1957 *Hanunóo agriculture. A report on an integral system of shifting cultivation in the Philippines.* Rome, FAO. (Reprinted 1975 Northford, Conn., Elliot's Books.)
1961 "The study of shifting cultivation", *Current Anthropology* 2: 27-61.
1963 *El estudio del cultivo de roza* [The study of shifting cultivation.] Washington DC, Union Panamericana.

Dreyfus-Gamelon, S.
Forthcoming "About traditional swidden cultivation in the lowlands of South America". (Paper presented at the Symposium on Anthropology of Shifting cultivation, Bhubaneswar, India, December 1978).

Fickeler, Pl
1954 "Das Siegerland als Beispiel wirtschaftsgeschichtlicher und wirtschaftsgeographischer Harmonie", *Erdkunde* 8(1/4): 15-50.

Frühwald, H.
1966 "Brandwirtschaft", in: *Der steirische Bauer, Leistung und Schicksal von der Steinzeit bis zur Gegenwart, eine Dokumentation. Katalog der Austellung, industriehalle Graz, 11. Juni — 4. September 1966.* Graz, Veröffentlichungen des steiermärkischen Landesarchives.

Greenland, D. J.
1975 "Bringing the green revolution to the shifting cultivator", *Science* 190(4217): 841-844.

Kroll, H.
1936 "Die siegerländer Haubergwirtschaft und ihre Geräte", *Zeitschrift für Ethnologie* 68: 269-281.

McEwan, J. R.
1956 "Shifting cultivation in Tsushima in the 18th century", *Asia Major* 5: 208-229.

Nye, P. H.; Greenland, D. J.
1960 *The soil under shifting cultivation.* Farnham Royal, Commonwealth Agriculture Bureaux.

Podolák, J.
1972 "Alte Rodungsverfahren und Brandwirtschaft in der Slowakei", pp. 143-177 in: I. Balassa (ed.), *Getreidebau in Ost- und Mitteleuropa.* Budapest, Akadémiai Kiado.

Portères, R.
1972 "De l'écobuage comme un système mixte de culture et de production", *Journal d'Agriculture Tropicale et de Botanique Appliquée* 19(6/7): 151-207.

Reichmann, O.
1966 *Der Wortschatz der siegerländer Landwirtschaft und Haubergwirtschaft.* Marburg, N. G. Elwert. (Deutsche Dialektgeographie, vols. 48a, 48b.)

Sigaut, F.
1975 *L'agriculture et le feu. Rôle et place du feu dans les techniques de préparation du champ de l'ancienne agriculture européenne.* Paris/The Hague, Mouton.
1977 "Dynamique des systèmes culturaux traditionnels en Amérique tropicale. Rapport de synthèse", pp. 397-407 in: *Actes du XLIIè Congrès International des Américanistes,* vol. 2. Paris, Société des Américanistes.

Spencer, J. E.
1966 *Shifting cultivation in Southeastern Asia.* Berkeley, Calif./Los Angeles, Calif. (University of California Publications in Geography, vol. 19.)

Steensberg, A.
1955 "Med bragende flammer", *Kulm:* 63-130.

Wilken, G. C.
1977 "Integrating forest and small-scale farm systems in Middle America", *Agro-Ecosystems* 3: 291-302.