UNCLASSIFIED

AD NUMBER

AD837490

NEW LIMITATION CHANGE

TO
Approved for public release, distribution unlimited

FROM
Distribution authorized to U.S. Gov’t. agencies and their contractors; Administrative/Operational Use; 1952. Other requests shall be referred to the Army Biological Laboratory, Attn: Technical Release Branch [TID], Fort Detrick, MD 21701.

AUTHORITY

SMUFD, per d/a ltr dtd 14 Feb 1972

THIS PAGE IS UNCLASSIFIED
This publication has been translated from the open literature and is available to the general public. Non-DOD agencies may purchase this publication from the Clearinghouse for Federal Scientific and Technical Information, U. S. Department of Commerce, Springfield, Va.

DEPARTMENT OF THE ARMY
Fort Detrick
Frederick, Maryland

STATEMENT #2 UNCLASSIFIED
This document is subject to special export controls and each transmittal to foreign governments or foreign nationals may be made only with prior approval of Dept. of Army, Fort Detrick, ATTN: Technical Release Branch/TID, Frederick, Maryland 21701
CONDITIONS OF THE CULTURE OF RICE
IN THE HIGHLANDS (Vietnam)

by
P. BERTRAND

L'Agronomie Tropicale 7(3): 266-75, 1952

Best Available Copy
CONDITIONS OF THE CULTURE OF RICE
IN THE HIGH-DANNOI (VIETNAM)

The notes which follow were taken in the course of an inquest
carried out in the region of Djiring and of Bleo in 1943.

The possibilities of transport, excessively reduced following the
war, even in consenting very elevated prices, cruelly put in evidence a
weakness of the economy of these regions.

In addition autonomic mountaineer tribes, the High-Dannoi had to
nourish about twenty thousand immigrants, farmers, artisans, workers and
their families, natives of Vietnam, above all of North Vietnam. Gross
consumer of rice, this population did not produce it.

This surplus of consumption did not cause, or affect the augmentation
of the production of the mountaineers. On thought even, wrong or right,
that the local production had to the contrary diminished.

Opinion had it that the local seedings were "deteriorated" and that
it would have sufficed to replace them to see the production greatly
increased. They waited the action of the agricultural services for this
sort of miracle.

TRADITIONAL CULTURES OF THE MOUNTAINERS

Reserve made of the "case cultures", that only occupy minimum surfaces
in the immediate accesses of the habitations, one remarks, at first sight,
that the mountaineer cultures divide themselves on three levels:

a) rice fields which occupy the bottom of the valleys, visibly
flattened, dammed and irrigated;

b) fields that one meets on gentle slopes, at the flank of hills
end of rounded hills, toward the base of mountains;

c) genuine forested "felling areas", of geometric contours, that one
sees on the elevated banks, in the neighborhood of ridges.

These three levels of culture are the result of three different
ethnic groupings. Each tribe, and they are numerous, has its traditions,
its own methods, to which it is always very attached.

It is thus in the Djiring region:
The Pho live in fixed villages, cultivate above all the valleys by the inundated rice field method, practice very little "rey" (1), always close to the villages and only as a balance culture. Apart from the minuscule gardens, they cultivate only rice.

The Zills are great nomads. They practice uniquely the rey on elevated slopes. They fight with great work the huge forest, burn it and cultivate the terrain for as long as possible. When the soil becomes depleted and the yields drop, they abandon it and start over further on. They never return to the same piece, but if they do return at all much later on, it is when the forest is completely reconstituted. The villages thus are subjected in the long run to considerable displacements. They produce both rice and maize, arriving in this way at two crops in the same year. They are well nourished, strong and herdy; they are excellent lumbermen and great burners of forests.

The Ik have their habitat at the foot of the mountains and cultivate the gentle slopes. They cut down and burn the forest, and make, in its place, rice during two consecutive years or three at the most. The rey is then abandoned during ten to thirty years, after which the same village cultures it again.

They act in a way analogous in respect to a few small valleys, that they treat in inundated rice field, and abandon after the yield lowers to then return later on. There is thus established a rotation that makes alternate, in a vast perimeter, a brief culture with a long fallow according to a more or less constant cycle. Certain ceremonies, that return every twenty-one years, tend to make one think that such is the period of it, at least in principle.

The habitations displace themselves with the cultures on the interior of the same perimeter, that the village considers as the territory that belongs to the clan.

The villages of this tribe cultivate, spin and weave on annual cotton or use certain fibers, quite analogous to the hemp, that it finds in the forest. The Ik have, near the habitations, gardens of a certain importance.

It is quite remarkable that the three groups overlap or enclose themselves without becoming mingled and without provoking disputes; each has his field of action different from those of the others.

---

(1) "Rey" Indochinese term denoting, in the mode of itinerant culture, the field of culture prepared by fire.
CHAPTER OF THE RICE FIELDS

The rice fields of Chishma are

organized in very perpendicularly

shaped fields. The bottom of the vil-

lage is, in the hinterland, forming three
classed levels; solid dikes and divide

them in very small sets of polder-areas,

narrowly horizontal. The dikes are often

opened (Victorino) and make a between them a canal, that

drains either for irrigation, or for
drainage. The rivers and streams are blocked, diversion canals conduct
the water upstream to the rice fields; the arroyos often follow
a course of several kilometers in winding around groups to irrigate sec-
ondary channels, or else collect, to the benefit of a small rice field,
water from a spring or of neighboring streams.

The solid, narrow rice fields of the Llano are arranged in a more

cordial manner.

The first and the others give very careful methods. The first

leaves are carried out, when the first stormy rains of the season have
well soaked the soil, that is to say in May-June; then they repair the dikes
and the canals. During this time the rainy season establishes itself
and the water courses have acquired a sufficient supply, so that one can
be assured of irrigating it will. The rice fields are then leveled and given
a second labor, often crossed, about a month after the first one; then,
they become for a long time by means of a strong-hitched rope, with
a second tooth, until it gives the soil the consistency of a fine liquid
and; the mud is again released and at the same time flattened by passing
over it a giant plow hitched by its the extremities.

The seeding is done quite soon after, on this very fine and, semi-
liquid and of perfectly flat surface, recovered with a wet bed of about
4 cm. To begin with they use the weir-plates by streaming them in
water for the three rights, taking them out during the dry. The seeding
is done directly in the streams and by hand, by four consecutive
plates of seeders, thus divides the tradition. If there is a
clerical of seeds, they only do three years, but they know that the
water will be lost, and then the bed promised will invade the rice
field. The count is from 20 to 100 kg of seed.

The water is poured the day five days after the seeding. It is
introduced with generation from the drains, up to 10 to 15 cm; they maintain
it, during the entire vegetation, at a level in relationship with the
height of the plants; they never dry it, even at the time of maturation.
The upkeep of the crocks, the destruction and evacuation of the water are the subject of a daily surveying on the part of the Cholbro.

In this way, and that the rice fields closest to the water courses are inspected by a fleet; these inspections are always very brief, one does not protect himself against it and the culture hardly suffers at all; often it even learns to receive a whirlwind.

The date of the harvest varies according to the cultivated varieties. It is done in cutting the high-yield transplant at the sickle, all as in the delta of Vietnam. Small quantities are cut out by hand; but the bulk of the crop, that takes place in January-February, is cut in large and in hogs, that are tried out by buffalo feet afterward. The leading harvests end the stocks attract and serve for smoke and a continual supervision until the end of the threshing.

The yields are generally good; one to the tons, with an average of about 1,500 kg per hectare. But for small rice fields exist. This is the case even in the small valley of Briching; there, it is rare to obtain 1,000 kg per hectare, it is frequent to have less than 500 or even 300 kg, the average stays in the neighborhood of 500 kg per hectare.

The rice fields in the environs of Briching end of rice sown in mixtures of several varieties, yet the cultivators of jambos them all under a small number of may, which includes in the only to the survivors of evolution and the production on that remains to the rice into three categories:

a) ordinary rice, whose duration of evolution is about six months and more,
b) early rice, of three and one-half months and four months,
c) rice, whose duration is less than six; of the sort that they are used dry cereal rice.

It is rarely easy to obtain precision on the date of cultural events, as the Briching cultivators or at least do not have a calendar. It is those events, therefore, that on the calendar serve then as points of chronological time.
They attach much importance to the moon, that count the days of a new moon to the following one in numbering them; this care is delegated to the old people "who do not sleep at night". But, in order to situate the junctions, they do not enumerate them, they relate them to natural events. For them "the first moon after the beginning (or the end) of the rains", "the moon, where such animal emits the cry of loves (or of the laying of eggs or of the throwing (young)...)", "the moon of such end such fruit or flower" constitute quite clear definitions and besides perfectly adapted to their occupations. The years are counted by the number of harvests and begin, in principle, with the first moon, that follows the harvest; this last one is the occasion, naturally, of a ritual ceremony, but it does not take place every dry in all of the villages, nor even in all of the families. They do not even notice that, in this way, twelve junctions go by from the beginning of one year to the next or to the contrary thirteen.

Ceremonies celebrate, by "sacrifice to the spirits", the "seeds", the "beginning of the formation of the grain", "the complete formation of the grain", the "end of the harvest" ceremony already spoken of and finally "the grain in the granary", which takes place in the second moon of their year. A single solemn ceremony is regular, but it does not serve so much for the origin of weather, it is the great festival of Tobou of the Earth, "Wer Sow"; it takes place, always and everywhere, the same day: the seventh and the third moon after the harvest.

That is the situation of each rice field with regard to water, which determines only in fact the dates of seeding, of harvest, and, consequently, the use of such or such seed, even though one knows, for example, that the rice has a short cycle and only has a yield of two thirds of that of ordinary rices.

These last mentioned are used by preference and one finds them everywhere in general, where their vegetation is assured, from the second moon of the rainy season, towards our month of July, right until the end of this same season, around January-February.

The rices of three and one-half moons and of four moons is seeded at the same moment in the rice fields, that run the risk of lacking water at the end of the season, one harvests them from about November.

The rices of the "dry season" serve to sow: either early, the rice fields that have water before the establishment of the rains, and that will be harvested before a probable inundation, or tardy, after inundation often, to one that can be irrigated again after the rainy season; or finally all of those that could not be sown at the normal weather or time, for what reason have you.
One designates by the name of "Koe Pe", that is translated "mother
rice", the most cultivated rice of the village, a principle phenotype
mixed with 40 or 50% of others of the same calendar.

A few rice fields, reputed to be the best ones and belonging to well
off gentlemen, carry a little later rice, by about ten days, appreciated
for its color and for its taste, that is called "Koe Bo" (white rice) or
"Koe Yok" (en�mite rice). The term "Koe Phang" designates the ensemble
of early ripe rice.

CULTURE OF THE RAYS

That which we call "rye", from the en�mite name, is called a "mir"
in Koho language.

The location of these new rye is chosen by the village chief and the
sorcerer, according to rules and traditional signs. Certain places are
recognized tabooes and must be spared and even protected. The result of these
deliberations is, in large, the following: avoid too little fertile zones
and those where the brush would have too much trouble reconstituting
itself, make the most of the interior of uprootings, particularly on top
of the slopes, thickets and windbreaks favorable to exterior reconstitution.

According to the local conditions, the village traditions and also new
or accidental circumstances, the reclaimed brush is a true forest, a pole
wood herily reconstituted, a thicket, in truth a more or less woody sauce-
manch. The cutting is done in full dry season, around January-February.
Everything that is cut is left in place for about two months. They put
fire to it one month before the rye.

This burning seems to have great importance, the mountaineers hold
to it to a great extent, and we have stated, at the experimental section
at Bico, that the trial cultures of vegetables and of grasses, made on
newly reclaimed terrain, marked a very strong superiority to the places
where a part of the reclaiming materials had been assebled in swaths
and burned.

The soil thus cleaned, and perhaps improved by the burning, is
returned to the hoe. Only the Cholire, who do not practice ryes or only
exceptionally on extremely slight slopes, use the plow.

The seeds are formed, a little earlier than in the rice field, in the
second season of the rainy season, that is to say towards May or June, one
of the extreme importance to the phase of the moon, the tradition claiming
that that which is seeded, before the third or after the seventeenth
of the moon, should not succeed; it is a fact that the hindrance to
the seed has an enormous effect on the yield.

When the slope is slight they seed at random. But, but after it is
slightly more sloped, a cultivator carves himself with two long sticks,
with which he digs a hole with each step that he takes, from one edge to
the other edge of the field, another one follows him, who puts three or
four grains in the holes and closes them up with a kick of the foot, one
thus obtains regularly spaced and well aligned pockets.

The seeds are numerous, one repeats the weodings without stopping up
until the flowering.

The more premature varieties, say from three and four moons, are
harvested from September or October; the most cultivated ones, say of
six moons, are harvested in November-December.

Nearly all of the key varieties shall with extreme facility, one does
not cut the stems, one simply sepures the grains of the panicles with
the hand.

The reys generally give excellent yields.
In rich earth, well prepared, well weeded,
they often produce 2 tons and more of paddy
per hectare; but a bad culture, due to a tardy
seeding, deflected by the weedes, falls very
quickly, for less than 500 kg. The general
averages is notably superior to 1,500 kg. per
hectare.

Certain particularly fertile valleys,
but cold, the reys pass for being more
productive than the rice fields, which
is not meant to surprise.

The mountaineers distinguish the numerous varieties of rey rice, as
much by the report and taste as by the duration of evolution. Their names
are often the same as those of rice from the rice fields, but there is
no identity nor analogy.

The "Koa Ne" (mother rice), is sown first, by tradition, and is harvest-
ted six months later, near the end of November. It is the most widespread,
it produces much when the soil is good.

One also finds a "Koa Bo" (white rice), different from the hoe Bo
of the rice field. It perceptible has the same calender as the Koa Ne and
is preferred to it in certain villages.
The "Koo Len" (smoked rice) has black glumeless. It also has the short calyx, it is quite white and red, although little appreciated, it is often cultivated in mixture with the others.

The "Koo Thin" (the rice seed (*) is tardier by a few days. One appreciates its taste.

The "Koo Brong" (red rice) is the most premature of the seasonal rice.

The "Koo Re" (rice from the rice field) is thus named because it looks like the last mentioned, its bracts are very short, it doesn't shell, it is harvested by cutting the stem and by tredding out.

The "Koe Non" is a premature rice, seeded one month after the others, it is harvested from November on. It passes for a big producer.

The "Koe Prong" is a four moons rice, of fixed evolution duration, it is harvested prematurely or in mid late.

The "Koo Prong Re" (rice with loose panicles) is another four moons rice.

Another "Koe Prong" (rice of the dry season) is very premature, the first cultivated and harvested; its taste is little appreciated, but "it ferments well in jars".

Just as in the rice field, each cultivator grows a minimum quantity of stray rice, or "Koe Hae", for the celebration of ceremonies and of ritual cakes. Numerous varieties of Koe Hae, of rye and of rice field exist.

All of these varieties of rice from dry torrent are barbed.

One does not cultivate one variety rather than another, on "new" or on an old "rye" of two or three years; one observes no rotation at all, or less advanced degree of impoverishment of the soil.

The notion of the "wear-out of the "rye" must be considered with certain reserves; the rye crown is severely invaded by the annual vegetation from their second year of culture, the decline of yield is due to this invasion as much as to the fall of the fertility, etc., the culture difficulties being added, the rye is abandoned well before it is really mature.

As in rice field, the situation of the more or less vast glades which form the cultures in the middle of the wild brush, necessitates...
particular care in order to avoid the damage of fellow deer and birds. 
Quite early, one establishes a barrier with thorny branches and broods, 
once constructs miradors and ingenious noise maker apparatuses controlled at 
a distance, one establishes traps. That would not impede the birds, the 
steps all above all the wild boars to commit enormous damage, were it not 
for our most continual vigilance, that requires the presence of the culti-
vators on their field, every day, from the planting up until the time where 
the grain is enclosed in the granaries.

Observations

It is an often received opinion that the mountaineers are lazy and 
mediocre cultivators, less good, in my case, than those of the plains 
and the delta. I am convinced of the contrary: they are careful 
and gifted cultivators in the "earthy sense". Relative to their mode of 
life and to their way they are not far from what in their place we would 
call "full usage". If their productivity per man or per hectare is small, 
it is due to their technological level that we must attribute it.

They work their soils with not care, save the grains carefully 
harvested and conserved for this reason, keep up their maintenance work, 
they interrupt their work only when "the grain is in the granary", but 
then, or on their own vol, they "rest themselves" until the following culture, 
besides they have nothing else to do. They faithfully observe the precise 
traditional rules and quite judicial ones they are, and merit no accusation 
of laziness.

It is true that from this activity and this care depend their existence 
even the survival of the tribes; they are intimately tied and blended in 
their mode of life. One cannot forget to notice the perfection of the 
dispersion, and also how much the mountaineer's agriculture, above 
all, that of the rice, with its rotation, its fallow land, its rules both 
strict and diverse, enhances more than a genuine "agricultural technique" 
or the very routine and simple "rice growing practice" of the deltas.

I had the chance, in other circumstanes, of verifying the faculty 
that the mountaineers have to copy and "understand" the methods and 
means of modern work, it is "water with them then with the rice growers 
of the plain", but the fruit of this system, where life and work are so 
completely adapted one to the other, is its absence of flexibility. 
It would tell that all disturbances compromised the equilibrium of it.

The advanced views of the M.A. Plati and, effectuated in some measure 
from the exterior, could not avoid bringing trouble.
It requires important needs of manual labor; a great part of it is supplied by immigration, that introduces a surplus of population relatively considerable in relation to the number of natives, from which the accrued life needs. One could not expect that the traditional industry of the mountaineers be an measure of growth of their production in analogous proportions; being given the organization of their economy, a rise in prices, even very important, could not induce an augmentation of the production.

It is necessary to note that measures, such as the replacement of traditional seeds, even if it had been possible without requiring researches and adjustments always quite long, or the introduction of other "methods" would not have sufficed to resolve the question.

It happens also that the imported manual labor does not permit to face all of the needs in certain peak periods: the upkeep of the roads and trails for one thing, as well as some constructions, harvest jobs in the plantations, above all the coffee trees on the other hand, require the intervention of native workers, that one searches to procure, by manoeuvres that one can call "of seduction": elevated salaries, attribution of rice rations superior to the immediate needs, in truth even the bait of alcohol and festivities. It well seems that the deductions in advance effectuated on the traditional work of the mountaineers had unlikely effects on their production, effects not in proportion with the number of days.

Some mountaineers are definitely turning away from their villages, above all to the neighborhood of cities and centers of Vietnamese colonisation, these people only weigh down the consumption.

The needs of supplementary manual labor are placed above all at the beginning of the dry season at the time when the mountaineers prepare and carry out their own harvest; now, the mutual aid and exchange of days, that are the rule for the execution of methods and of sowing, do not play for the other supervision, the enclosure of the fields, the protection of pending harvests or from predatory beasts: an absence of a few days at this point has grave consequences.

It is to these facts that it is necessary to attribute the complaints, that great the appeals of manual labor in the villages. It is difficult to appreciate the losses that really result from it, but the discouraging psychological effect is certain, and even more, if important endowments
of rice create the impression that the life work is earned more quickly and with less hardship than by traditional works.

A less spectacular trouble, but a deeper one, rises from the installation of plantations on the best soils. These plantations deduct a portion of territories of traditional culture from the villages, or else they reduce the surface on which they practice their rotation, and the fertile land finds itself abridged, or else, they fall back outside of traditional courses, to the research of new soils, and it is necessary to fear while the acquired experience, that he guaranteed the fertility of developed soils in their possibility of reconstitution after culture, is put in misuse.

Without doubt the habitual regulatory inquiries were made to assure that the land newly sold was "free"; but the idea even of culture and fixed installation, perennials being inconceivable to the mountaineers, they could not foresee that the zones, unoccupied at the time of the investigations, would be withdrawn from their activity, when the time came for them to put the lands back into culture.

That would explain the importance of the wastes, that one had thought had contributed in the course of the past years, to the culture methods of the mountaineers. As it seemed difficult to admit, without serious reserves, the fact that their itinerant cultures normally tend to completely deforest the montaneous regions. Granted, the spectacle of barren slopes, the high forest sacrificed to the culture of a few years, can not leave one indifferent and the losses that one dreads from deforestation commands a wise prudence.

Nevertheless one cannot refrain from asking himself how the mountains submitted to this kind of culture, truly, or seemingly, for centuries, still have beautiful forests if they are not "reconstituted"; unless one supposes that a new cause, quite recent, had augmented unexpectedly the deforestation. This cause can hardly be an augmentation in number of the mountaineers or of their needs.

The extension of the rays, at least the recent uprootings of the great forests are verified, however. If one must believe those that have known and traveled the country for about twenty years, he is left with the impression of an active deforestation. But of what value are these pretended verifications? Only an objective observation, continued for several 5-year periods, on a minimum of thirty forests, could give a positive idea of the progress or of the perseverance of the deforested surfaces.

Aerial photographs, interested in very vast surfaces, and repeated from five to five years, permitted to observe the shiftings and the eventual
progress of the deforestation. The most favorable moments for the execution of the paotos are either that of the labors and young rays, in May-June, or that of the maturity before the November harvest.

This does not make it less real that the rays method is a spoiling of surface, of vegetal material and of manual labor.

The installation of colonization cultures, plantations or small Vietnamese colonies, does not bring a real remedy to this situation, unless one admits that they will eliminate the traditional cultures, with the elimination of the tribes that practice them.

The colonization of a part of the territory and the maintenance at the same time of the ancestral culture of the mountaineers, without precautions and without concomitant or even preliminary managements, can have for effect only that of rendering this last one more precarious, to accuse the inconveniences of it and to augment, if not to create, sterile conditions that one would dread. All the more when these effects add to an accrued proliferation of natives as a result of the amelioration of their sanitary state.

It is necessary to conduct these regions to an equilibristed economy in its entirety, to install systems of susceptible cultures, at the same time to nourish and to employ the tribes on location, in elevating their level of life and without brusquely upsetting their customs and their traditions, but in utilizing them at the same time as remunerating imported chiefs and manual labor for exportable productions.

By reason of wise economy of the soil and prudence, as well as by a psychological necessity, rice must not be excluded from the plateau cultures; even when it would seem more practical to buy it in the delta (remember that wheat remains a base culture in France, even if "its culture does not pay").

The perennial industrial cultures, that appeared, to concentrate the interest, do not realize themselves alone a good utilization of the soil and of manual labor, above all the coffee tree in quasi-monoculture. Their exploitation lacks flexibility, notably because it does not permit distribution of the work over a long period, nor the prompt changes, that one can make with judicious choice of diverse annual cultures. In addition, they make a great demand on the aid of other cultivators, they do not feed either their manual labor, or their beasts and do not produce fertilizer.

It is necessary that practical colonization, more than these perennial cultures, carry on a system of annual cultures in rotation, or the rice will suffer. With rotation, the rice will have its place, as well as a fodder production.
Parallelly, the rice culture by ry must tend toward a rotation of annual cultures, giving, at least to begin with, a large place to the production of rice. This system must result in diminishing the duration of the forest fallow land, the surface areas of vegetant territory of the villages, the consumption of wood, that make the uprootings. It must tend to augment the productivity of the natives, by extending the uprooting cycles. Cultures judiciously combined must allow employment of manual labor all year long and avoid periods, where a gross supplementary manual labor is necessary everywhere at once. These massive and temporary needs have inevitably for effect excessive cost prices and do not avoid creating a social and even a political problem.

This system must have for objective the rational putting in culture of the best lands of the plateaus and moderate hills, with the obligatory alternation of clean and dirty plants, of plants with superficial and deep roots, of exhausting cultures and enrichening cultures and with periodic fertilizing. Of this sort, yields will be far superior to those that one has a tendency to hope for from the "transformation in rice fields" of marshy bottom lands.

Some "experiences" of the transplanted inundated rice fields, made for the enhancing of certain bottom lands, in particular by the Inspectors of the Indochinese Guard employing to this effect their guards, their prisoners and, on occasion, some mountaineers in the environs of their post, could make one think that therein lies truly the best method of cultivating rice.

But I am not of this opinion. The returns of these "experiences" hardly permit one to judge them with accuracy. The experimenter, full of good will but lacking elements, noted no importance, the surfaces are approximated, the name and origin of the seeds employed are missing. But it is evident that, convinced of the superiority of his method, he employed his authority in assuring his triumph. His power over a small collectivity, the extraordinary work of his manual labor strictly supervised and free, his ardor and his enthusiasm must be considered as the surest cause of his conclusion. That which one can verify is that the rare rice fields thus created never held up after the departure of the creator, they disappeared and one never has observations on the maintenance, the augmentation or the diminution of the yields after a prolonged culture.

Surely, it is necessary to encourage the culture of rice fields managed by the villages, which is the practice; they are very well cultivated although not transplanted, which is not necessarily a fault. One could perhaps try it, but with prudence, as an extension method. But the true mode of culture of these regions is...
culture by ray, whose yield is known to be superior to that of the rice field; evidently, the fertility can and must be maintained or re-established other than by a long forster follow. Research must support these alterations, which will maintain the fertility of the soil in not interrupting or very little its productivity. The bottom lands, if they must be cultivated, will do better in green folder.

COMPARISON WITH P. SCILIA

Dry culture of rice is also practiced in a few regions of Cambodia. The comparison between rice in irrigated rice fields and rice dry recalls certain observations that one can make in this country.

Vast regions of Cambodi are constituted by very slightly inclined soils, of almost no relief, silico-muddy or muddy-silicious of beige or very light pink color, generally permeable but very slowly. They are indiscriminately covered over by characteristic light forest or by the rice field, both formations extending on considerable continuous surfaces; one also finds villages in the forest, where the rice is cultivated in the clearings.

He, who would penetrate the Cambodia, for example by the Eastern frontier, and directed himself toward the Bassac, would have the impression of observing a curious evolution of the culture of rice.

In the first hamlets that he crosses, he finds few permanent rice fields; these are established in the small clearings and occupy the middle part of slight depressions that the terrain presents. Dominated everywhere by the forest, after the rains set in, sufficient and fertilizing water, the bottom of the thalweg serves as an outlet and permits a continual renewal, these small rice fields also have excellent yields.

Outside of these permanent rice fields, one finds numerous "chamars" dispersed in a radius of 5 to 10 km. around the village. These chamars are nothing other than rays, but poorly done rays, the trees were not cut down, there are numerous roots incompletely consumed by the burning of the brush. The maize culture and above all the rice is carried out dry, by a random sowing, between the remains of the primitive vegetation and on a soil that undergoes no preparation the first year. If the culture continues in the years following, the soil is worked and progressively removed. The duration of these fields is very variable and depends above all on the whim and the courage of the cultivator, in fact the repeated culture suits with the action of natural agents to make the rest of the primitive vegetation disappear, but on the other hand the casual vegetation invades more and more and the soil becomes degraded, often one lets it be
over to begin again the burning without waiting for the trees to develop.

The forest around the village shows numerous abandoned chamcars, invaded by a thin underbrush easier to clear with a machete and by fire than the true forest, one returns there well in advance before it becomes reconstituted. One can also recognize the location of old chamcars long after the villages were abandoned.

The clearings nor the abandonments are put under any rule, one takes the land or one leaves it alone according to his needs or his own whim. It sometimes happens that a village disappears or moves a few kilometers, but it is more to flee the maladiction of an epidemic or a famine or some quarrel than by system or feeling of need to renew the cultivated terrains.

In proportion as the traveler advances toward the center of the country the villages become more important and a little more dense. The clearings managed in permanent rice fields grow larger, become contiguous to form only great rice fields where all worry of relief, of dominating forest or exotory has disappeared, dikes assure the retention of water in small bins. The fertility feels the effects of it, the borders are rich but the rest has only very mediocre value of the great rice field plains of the country. The surrounding chamcars appear more and more like the first phase of the extension of the principle gap, the clearings far from the village are rarer, while the neighboring ones are more rendered to brush; one clears, one cultivates in the same manner in the course of the first years; at the end of five or six years one transforms them in inundated rice fields in surrounding them by dikes that retain the water.

When the forest ceases to make place for the cultivated plain, it seems only that one arrives at a clearing without end, where the successive extensions finished by rejoining and where the spontaneous vegetation is no longer represented except by brushy islets.

The transition from the forest to permeable soil to the inundated rice field, by the intermediary of dry, more or less temporary cultures accompanies it with modifications of the soil structure. This evolution was observed on an experimental station of the Indochinese Rice Office at Cambodia. The natural soil, covered by forest or brush is deep, it is perfectly permeable although slowly and is not at all sandy, even in full rainy season, except evidently in the bottom lands. A perfect clearing, completed by an equipping with bins surrounded by dams, does not suffice to make appear the aptitude of retaining the surface water, characteristic of the classical rice field. On the new lands the dry culture, analogous to that of the rays or the chamcars, is only possible. It is the continual repetition of the culture, that makes an impermeable level appear, at the
same time furthermore as the fertility diminishes. A clearing cultivated dry, then had a yield per unit of 3 tons the second year, which is the best one, becomes at the end of five years an ordinary rice field, that produces with great difficulty one ton when the year's climate is favorable.

One avoids, or one records considerably this double phenomenon when one allows the soil to rest and the brush to invade it in the course of a long fellow, this is the system of chamar of the forester villages.

One even verifies a certain reversibility: rice fields cleared a few years ago, worn out, but still completely in, or able and which from this fact were excessively sensitive to the aridity, were cultivated "dry" after the application of a strong organic fertilizer. The process was very clear. The popularization of the system, with strong fertilizers and the use of green dung instead of fellow, had begun when the war of 1939 came into being.

Numerous varieties of rice from Cambodia lend themselves equally well to two cultures, everything happens as if the conditions, that the plant finds in the very first days of its vegetation, decide its aptitudes and its ultimate needs. With this particularity, every time that the yields of the dry culture are very affected by the fertility and the structure of the soil; in terms that are rich and deep, they are very superior in the dry culture than in the inundated rice field; but, in the worn out and degraded terrains, the dry culture can yield nothing while the seeding in the inundated rice field gives, if one can dry so, still economical yields.

It is perhaps too simple a way in which one associates the idea of the culture of rice to that of better lands or swamps.

Rice is an admissible crop. It is the only one capable of pulling profit from lands, which present paradoxical agricultural conditions, as these regions, that water invades each year under a depth going from a few centimeters to 1 meter or more, or else these plains of Cambodia, having arrived at such a degree of poverty and degradation, that not one plant could get any advantage from the soil, while rice still succeeds in furnishing 500 to 700 kg of grain per hectare and per year.

RESUMÉ. Study of the conditions of the rice culture of the mountainous of South Vietnam. The author underlines, particularly, the equivalence existing between the nature of culture followed and the natural fertility of the soil.

Comparison with the cultures of rice in "chamar" in Cambodia.