

GLIMPSES OF THE PEPPER CULTIVATION IN THAILAND

by

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PREFACE

It was during 1930 that I first visited the pepper growing districts of Chantaburi. This was in response to a letter from the district officer, reporting about a disease of the pepper plant. During this and a subsequent visit, attention was devoted solely to the disease problem, and while some inquiries were made regarding the cultural practices, no detailed study was made of them.

With the reorganisation of the Department of Agriculture during 1935, the pepper disease problem was taken in hand more seriously and in 1936 I was entrusted with this disease problem at the pepper disease experiment station at Khao Ngua, Tha Mai, Chantaburi, where I worked for over a year.

During this period close contacts were repeatedly made with the gardeners of various villages, giving me an opportunity to make a thorough study of the methods by which pepper is cultivated in that part of Thailand. This paper endeavours to describe and illustrate briefly the method of cultivation of pepper and also the environmental factors prevailing in that district. However, it is intended to publish further parts concerning pepper in succeeding numbers of this bulletin.

INTRODUCTION

Phric-Thai—the local name for pepper (*Piper nigrum*)—has been cultivated by the people of certain parts of this country for centuries; but when and how this plant got established in Thailand, is a matter which has not been very well studied. Many writers on the subject have shown that pepper first originated in tropical India and was later brought to farther Asia, that is to the East Indies, by the European traders. Therefore it is quite likely that its cultivation spread northwards towards Thailand and Indochina from these islands.

From certain evidences, I am of the opinion that Thailand and Cambodia being under the influence of Indian culture long before the European traders knew of the existence of this part of the world, cultivation of pepper was perhaps introduced then. Be that as it may, this country has been mentioned in various books as the land of spices.

Pepper cultivation here had its ups and downs from time to time; price being the important governing factor. There were times when the cultivation of pepper was threatened, when a picul (60 kgms) of black pepper fetched not more than Baht 15/—. This happened sometime during and little after the world war of 1914. Since then the price kept on increasing with increasing demand, when it gradually rose up to Baht 100/— and more per picul. This enabled the gardeners, especially in the districts of Chantaburi, to amass money, changing entirely their status of living. However this state of affairs did not last very long and the price started falling gradually till it came to Baht 45/— to 40/— per picul in 1930. Then in 1937 there came a sudden fall in price due to the collapse of an attempted corner of the Occidental pepper market, and within two years of that time the most that was offered for black pepper was Baht 10/— per picul. During these years the cultivation of pepper suffered the most due to the neglect in management. However, recently there are signs of improvement in the price and before long the cultivation, which is almost disappearing, may get reestablished.

The Provinces of Chantaburi and Trat, situated on the East Coast of the Gulf of Thailand, are the only pepper growing centres in this country at present. However, changvad Trang located on the west coast of peninsular Thailand once grew this spice on a fairly big scale; but due to the increasing demand and high returns from rubber, the pepper plants were replaced by the former. This paper is written from observations made in Chantaburi province especially in Amphur Thamai.

CLIMATIC CONDITIONS OF THE REGION

Rainfall—Chantaburi and Trat being on the east coast of the Gulf of Thailand get the full advantage of the south-west monsoon. In the hilly districts, back from the coast, the rain usually commences early in April. At the lower elevations where pepper gardens are located, the regular monsoon rains commence during June. However, occasional heavy showers of very short duration, accompanied by strong winds, are of common occurrence during April and May. Continuous rains lasting for days are almost unknown. The precipitation is at its maximum during August and September and by the end of October the regular monsoon season ends. Then during the following months with the wind blowing from North East little rain is always expected. February and March are very dry and as a result during these months much labour is devoted to watering the pepper plants, particularly those grown in sandy soils. The total rainfall, as recorded at Thamai, ranges from 100 to 150 inches.

Humidity—Considering the rainfall distribution, the close proximity to the sea and the evergreen forests which bound the entire district inland, the relative humidity of the place is fairly high with but little variation. The lowest relative humidity prevails during the months of February and March. As a rule the maximum relative-humidity is noticed in the early hours gradually decreasing during the day except on a rainy day. There is a sudden change in the relative humidity from November onwards. This is because of the cool and dry winds from the North and it has a great bearing on certain cultural operations.

Temperature:—The region seldom experiences heat above 100°F whereas during the colder months it seldom falls below 60°F. While a little increase in temperature from the normal has not shown injurious effects, temperatures below 60°F during the cold season have a decidedly harmful effect on both the catkins, namely the fruiting spike, as well as on the pepper vines as a whole.

TOPOGRAPHY AND SOILS

Chantaburi Province as stated above lies along the Eastern shores of the Gulf of Thailand and extends inland to the North and East far beyond the mountains. Except for the few hilly spots the whole coast line is made up of swampy deposits in broad estuaries, some of which penetrate inland up to a distance of as much as 10 km. The whole country side may be regarded as hilly and mountainous, the highest elevation being Soi Dao mountain which is nearly 2,000 meters high. This is located north of Chantaburi town and forms a part of the chain of mountains running in a south-easterly direction, parallel to and about 50 km. farther from the coast line.

Between these mountains and the coast line there are a few isolated hills here and there, composed mainly of granite and related rocks, with the exception of a few basaltic outcrops between them; such as at Amphur Thamai. Except for some lands on the coast the country is very undulating, numerous streams flowing through and draining this province.

From the nature of the predominating rock one would easily guess as to the type of soils met with in this region. As a whole the soils are of a coarse sandy loam type having an ash grey colour, with varying proportions of coarse and fine sand, clay and organic matter. In places the colour is intermingled with a rusty brown tone due to the presence of iron.

The sub-strata vary considerably from place to place. In parts stiff clays of pink to dirty white colour are met with at a depth from 1 meter to 10 meters. In certain portions especially lying between the steep hill-slopes and low flat land coarse angular quartz intermingled with or without iron concretions may be observed either very close beneath or as deep as 1 meter or more below the surface soil. But near the steep slopes of the mountains solid rock boulders are found under the soil or partially exposed on the surface.

Pepper is now cultivated on such sandy soils to only a comparatively small extent, and particularly where it is neither too sandy nor very stiff.

However the type of soil on which pepper is cultivated the most is a red friable clay, deep and very well drained. Such soils are found in certain few places in the vicinity of the basaltic hills mentioned above. The red soil region at Thamai covering approximately an area of 45 sq. kilometers is the most important from the point of view of pepper cultivation. (*Fig. 1*)

This body of soil is distinctly higher than the surrounding low sandy lands, the highest spot being over 40 meters above sea level. While fairly level patches are found here and there, the whole area may be regarded as rather undulating or sloping. Around the edges of this raised body of red soil laterite (1) is common almost every where at or slightly above the spring level.

Being very porous, there is a considerable loss of soluble plant food ingredients from these soils through excessive leaching. Regular manuring is most imperative and with certain crops liming has done wonders.

The red soils and the sandy soils described above are acidic with the pH very slightly above 4.5. This acidity is corrected to a certain extent by the use of burnt earth, the pH of which is over 6.

CULTIVATION.

Selection of land for pepper :—In the red soil region very little attention is given to the land except the very gravily spots near the hills and open bare lands (2) which are particularly avoided. (Fig. 2)

Ordinarily, lands under shrubs or trees for some years or lands under cultivation, or old fruit orchards are regarded most suitable. Old pepper gardens are not considered suitable; except after some 3 or 4 years planting of such crops as sugarcane, tobacco, pineapples and ground nuts. (3)

(1) *Laterite and its structural uses in Thailand and Cambodia*, by R. L. Pendleton. *The Geographical Review* Vol. XXXI No. 2 pp. 177—202.

(2) Open lands are those, which, due to their being higher than the rest of the area surrounding them and having the water table very deep below have been left fallow for many years now. An inferior sort of grass grows very thinly about an inch high on the surface. During the rainy season the cattle graze on it. As soon as they are noticed the droppings from these animals are collected, placed in heaps and ultimately stored and used as manure for pepper. Therefore it will be seen that not much is returned to these lands and since they are higher no sediment can wash onto them to bring plant food. The surface few inches of the soil are very compact and hard, at the same time very porous; so much so that a vehicle may go over it during and after a heavy rain, without any difficulty.

(3) Groundnuts grown on these red soils in spite of the excellent vegetative growth have failed to give a good yield. Experiments conducted at the pepper station have shown distinctly that liming produced normal crops.

As for the sandy soil regions outside the red soil district and further inland, great attention is given to drainage in selecting land for pepper: Poorly drained shallow basins or depressions are never utilized for pepper or for fruit trees. Such lowlands are to a great extent used for padi, and the pepper gardens stand on lands surrounding them. Unlike in the red soil region very great importance is given to selecting land and soil for pepper. The local term *Moon Ped* (meaning duck excreta), is applied to qualify the type of soil resembling duck manure, in mere appearance of course. And it is this very soil which is regarded as good for all crops including fruit trees. In these soils the finer sand particles form the main bulk. The coarse sand and clay are comparatively very little. The surface layer is very rich in organic matter, most of which disappears as the cultivation progresses. Land already under some sort of natural growth—primary or secondary is cleared and pepper planted after the vegetation is burnt and the stumps completely removed.

Preparing the land:—After the land is cleared of shrubs and trees it is dug to a depth of 2 to 3 ft.

Digging is usually done in two stages, the first being not so deep. At times when the land has been under brush wood and shrubs for a long time, it may be done in one operation. The soil is dug in strips about $1\frac{1}{2}$ meters broad, sometimes many hands working together side by side. The surface soil to a depth of about 8 inches is thrown very low on the side of the trench, and is ultimately covered with the subsoil. Thus the weeds are buried deeply.

At least one month is allowed to pass before the second digging is done and at this time the clods are again broken up and the subsoil brought on the surface killing the weeds completely. (*Fig. 3*)

The soil is dug and made ready for planting before October which means that the land is prepared during the rainy season.

Preparing the garden for planting:—After the soil has been properly dug it is marked out by fixing short bamboo stakes or slips (4) on the square at a distance of 1.75 m. The pits are dug very close to the stakes having two sides perpendicular and the other two sloping. What is actually wanted is the necessary depth and the side near the stake

(4) These are made from well-matured old, thick bamboo as they are supposed to last for a long time, at least until the time when the permanent supports of hard wood are fixed.

quite perpendicular. These conditions are fulfilled by digging the pit in the above manner. After this is done a quantity of a mixture of 1 part of dung with from 2 to 4 parts of burnt earth are heaped by the side of the pit, but on the opposite side of the stake, sufficient to fill the pit to more than $\frac{3}{4}$ its depth. Since good dung is not readily available at this time of the year and also since its use is not considered quite essential at planting time, very often burnt earth alone is used. (*Fig. 4*)

Preparing the planting material:—Pepper in Chantaburi is propagated exclusively by cuttings (5). These are always obtained from the young vines planted during the previous year. A day previous to planting the main shoots which have been systematically trained on the supports, are cut off very near the base and carefully removed.

These shoots, which are about 5 ft. long, are pruned and one or seldom two layer lengths for planting are prepared from them. While doing so very great importance is given to the roots at the nodes. Ordinarily these roots are produced at every node on the side which is towards the support when the plants grow. The main function of these roots then is of clinging to the support, and so are very short and spreading not more than $\frac{3}{4}$ of an inch on each side of the stem. And it is not always that all the nodes will have good roots, therefore some judgment is required in preparing a cutting. At least towards the base and the top portion of the cutting the nodes must have well developed roots. Ordinarily one layer could be obtained from one stem, but those of good length and possessing well developed nodal roots throughout, may be cut into two layers as already stated. In pruning, all the leaves and the side shoots are removed very close to the stem, with the exception of one or two at top which if necessary are pruned but very little, leaving a few leaves on them. (*Fig. 5*)

Only under very special circumstances, such as when the ordinary cuttings are not available, similar shoots may be obtained from older plants, the main stems of which are cut back to about 4 feet from the top, some time in May, that is before the rainy season sets in. That being the usual time for annual manuring, a fair dressing of dung and burnt earth is given to these plants. The new shoots that grow from near about the cut ends during the rains are ready to be removed during

(5) Considering the length of these cuttings and the presence of roots at the nodes, one may be inclined to call them layers.

October. However cuttings prepared from them, are not as good as those derived from young plants.

The length of the layers vary, depending on the kind of soil into which they are to be planted. In the red soil region they are seldom less than 20 inches while those meant for the sandy soils are a little shorter. The length of the portion of a cutting left above the ground being the same irrespective of the kind of soil in which it is planted, a longer cutting enables deeper planting.

This difference in the length of the cuttings may likely be due to the behaviour of the soils in respect of their water holding capacity, which in the case of the sandy type is less. Thus the regular watering of the plants grown in the sandy soils is most imperative, irrespective of the depth of planting. Whereas the red soils being more retentive of moisture need not be watered as frequently, and a little deeper planting in this case adds to the advantage, enabling the plants to grow normally.

The prepared cuttings are planted in holes already dug and kept ready for the purpose. This is generally done on the following day; but for some reason when the planting has to be put off for a few days, the cuttings are wrapped in a wet gunney or in plantain leaves, kept in shade and watered twice daily.

Planting.—Pits having been dug and the cuttings prepared, the planting proceeds. Unless it is a rainy day planting is almost always done during afternoons. Although one man can do this job two men can work effectively. Two layers are planted in one hole. One man holds them about 2 inches apart and close against the vertical side of the pit where the stake has been fixed; the nodal roots facing the opposite side. Only two nodes remain above the level of the soil. The other man then shovels in the mixture of dung and earth, using a 'Chakraw.' Some very particular gardeners prefer to press a little of the original pit soil against the layers so as to keep them firm in position before the pits are filled. Besides making it possible for only one man to do the planting, this method, according to the belief amongst the local people has some beneficial effect on the tender roots that just start out. Probably this is due to the burned earth which if not properly seasoned, does at times have an injurious effect on the roots of plants and may even kill some of the more delicate ones. However, after a few waterings, this harmful effect no longer exists when the burned earth becomes an attractive medium for root development.

After planting, the pits, if not sufficiently filled with the treated earth, are completely filled with some of the original soil dug out from the pit. The soil is then pressed down firmly by the feet, and the remaining soil is used for making a ring forming a circular basin round the plant, thus facilitating watering which starts immediately after planting.

Shading.—Newly planted layers are shaded, first thing, the following morning. Small branches something less than a meter long from nearby trees, the leaves of which do not fall on drying, are fixed into the soil. However when the area planted is large, fronds of 'Phong' a kind of fern, are generally used. (*Fig. 6*) These fronds provide just the right amount of shade and are not so bulky. It is collected in the marshy and pitty soils along the coast where they are found growing in considerable quantities.

Watering.—As they start growing the cuttings need regular watering, especially during the drier months that follow the planting. Water is lifted from wells, which in some places are very deep. A plant receives 8 to 10 liters at each watering. (*Fig. 7*)

Flow irrigation is entirely unknown in Thamai, mainly due to a very limited supply of water in the wells during the dry months when in some, located on higher lands, the level may be as deep as twenty meters below the surface. However some gardens, outside the red soil region at Nong Phai, do have the advantage of running water which comes from a pond, artificially made by bunding one side of a depression. At Khlung, a district at the foot of Khao Sabab, the pepper gardens benefit from the perpetual running water brought by streams coming from that mountain.

Interculture.—During November *i. e.* a little after the planting is over, the surface soil is dug thoroughly. At the same time the ridges are formed so that the plants stand on these broad ridges. To minimize the surface running off, thus preventing undue loss of the surface soil, these ridges run across the slope. (*Fig. 8*) As a matter of fact all the gardens are dug at this time of the year.

Except for watering from time to time as found necessary, the young plants do not require any special treatment until May. They keep on growing bearing a few shoots which may project out through the shade material.

First Pruning.—Just when there is a change in the weather, with the approach of the monsoon, which is sometime in May, the shade is entirely recovered and the plants pruned back in such a way that when they start growing again after manuring, and after a favourable change in the weather, they would put forth from four to six strong shoots per hole and not more. This, as all other pruning operations, is done by women folk.

Fixing of Supports.—The next and one of most important operations costing some money is the fixing of supports which are made from any one of the few species of hard woods available.

In case a gardener is not in a position to procure hard wood posts or supports at this time, temporary supports of moderate length which are obtained from nearby forests are used instead. For this purpose very young trees irrespective of kind and having a girth of not more than 30 cm are cut. The bark of this freshly cut wood is removed especially from the portion that would remain above the ground level. (*Fig. 9*) Removal of the bark is absolutely necessary. It is in connection with the detaching of the shoots, that grow on them, during the following October as will be explained later. The bark, as long as it remains in position without peeling off on drying, has no harmful effect on the shoots growing along on them. On the contrary it ought to provide the right type of surface for the nodal roots to cling and spread farther along the crevices; but at the time of detaching the shoots from such supports the roots tear very badly with the result that such shoots become useless for planting. On the other hand, when the bark does become loose on drying, it gets very hot in the sun and the roots that happen to be on this loose bark either dry up or do not make a satisfactory growth. Moreover, the loose strips of bark may come off and remain attached to the roots, there by making the operation of preparing the cuttings very difficult.

The supports are fixed by the side of the plant touching the small bamboo slip inserted as a mark before planting. Thus the marker stands between the two. (*Fig. 10*)

Training the Shoots.—Before the regular rains set in, the plants are manured with a mixture of burnt earth and dung. This is placed in pits on two sides of the plant.

Soon after the onset of the rains vigorous shoots start growing. As soon as they attain the height of 20 cm or so they are trained straight upwards on the support. Care is taken that they do not twist round the pole. This is done by tying the vines regularly as they grow. For tying thin strips of the bark of Thao "Wan Kho" are used. (Fig. 11)

The plant very often may produce more than the desired number of shoots. All such unwanted growth is removed at the time of each tying operation. Tying is done entirely by women, and attended to very regularly. The nodal roots will not make a desirable growth if tying were to be neglected.

To keep the black pepper bug under control, during the rainy season the plants are sprayed at least twice with a very effective contact insecticide. (6) This spraying is much the same as that given the older vines.

Pruning Back the Plants.—By October, that is five months after the young plants have first been pruned and manured, the shoots attain a height of over 1.50 meters. (Fig. 12) They are then cut back leaving only 2 or 3 nodes above ground. (Fig. 13) As stated above the shoots cut off at this time are utilized for planting. (Fig. 14)

This removal of almost the entire length of the shoots is necessary. The new shoots that start from the base give a thick and uniform growth to the pepper vines that develop from them. On the otherhand, if the original shoots were to be allowed to grow, the final growth of the vines would be comparatively thin so that they would seldom come up to the required standard of development.

Fixing of Permanent Supports.—Unless they have been fixed from the beginning, the permanent supports are fixed in place of the temporary ones, soon after the plants are cut back as stated above. Great care is exercised in placing these supports to see that they stand absolutely vertical. The height of the posts vary according to the taste of each owner. Higher posts provide room for a greater number of fruiting branches; however, other difficulties, such as experienced when picking the fruits and especially at the time of spraying the insecticide,

(6) Details described under the heading 'Pest and Pest Control' to be published.

are considerably increased. Considering these points the usual height of the supports in most of the gardens is around 3 meters (7).

The fixing of permanent posts is completed, generally before the end of October. It is then time for the annual digging.

AFTER CARE.

The plants are regularly visited to train the shoots straight up on the supports. About five to six shoots are allowed to grow on each support. Any new and undesirable growth that may shoot out from the base of the plant, as it generally does, is promptly removed. So also the sickly looking shoots harbouring borers are also cut back. For nearly four years this work continues, by which time the vines should have reached the top of the supports. Until this stage has been reached the vines are not allowed to bear fruits. This is done by nipping off the flowers, the same time when the vines are being tied, trained and pruned. If the plants are allowed to bear during the first two or three years of planting, the upward growth is checked.

After the vines have reached the top of the supports they are nursed and taken care of regularly all through the life of the garden.

Every year in May just when the monsoon sets in the plants are manured. During the monsoon they are sprayed twice or seldom thrice, to keep the pepper bugs under control. The weeds which grow profusely, especially during the rainy season, and after manuring, are scraped with a sharp bladed digging tool known as 'Chakhrao' and buried here and there in between the rows. During the dry months, when the weeds come up but sparsely, generally children are made to uproot them by hand. Towards the end of October or during the beginning of November the soil is dug over thoroughly. (*Fig. 15*) This preserves the soil moisture during the dry months that follow. The pepper fruits, that is the catkins, are collected in three pickings during March and April. (*Fig. 17*) The yield of black pepper ranges from three to four kilograms per vine.

(7) Due to the way in which manuring is done, when considerable amount of earth is used, the ground level rises a little every year, and by the time the garden is twenty years old the level may be raised to about one meter. So in case of the very old gardens the height of the vines will be about 2.5 meters from the ground.

Besides these seasonal operations, pruning is done with a view to thinning out certain portions of the vines such as the shoots which are infested with small weevil borers and unwanted extra growth that strike out from the main stem. At the same time the loose dead leaves which collect in various portions amongst the branches are also removed. This cleaning operation of the pepper vines is done at least once a year after the fruits have been collected.

The older vines have to be retied as they grow big. For this tying the stem of one kind of creeping fern known as 'Thao Kachot' is used. It has a thickness of not more than two millimeters; but is exceedingly durable and would last for three to four years.

VARIETIES OF PEPPER.

The two main varieties cultivated are known as '*Prangthi*' and '*Prangthot*' and both of these are also known collectively as '*Ban Cave*.' (Fig. 18) There is in fact a very little perceptible difference between the two and so the name '*Ban Cave*' is generally used. The catkins in both these varieties are generally full when mature. Those of the '*Prangthot*' are a little longer, while the internodes of the fruiting branches of the '*Prangthi*' are short with the result that there are more catkins per branch. These varieties came to be planted during recent years. The origin is still not known. The best yield per vine is equivalent to 4 kilograms while 3 kilograms are regarded as normal.

Both these varieties have a decided fruiting season and so in three pickings during February and March the whole crop is gathered.

Plants grown from the seeds of these varieties turned out to be distinctly different in many ways. For want of space and other facilities at the station, studies with the seedling plants had to be discontinued.

A variety known as "*Boran*" meaning ancient, was being cultivated before the Ban Kao varieties became established. This variety is decidedly hardy. The main drawback being the poor yield. Few fruits develop on the catkins which are generally very long. Plants of this variety are still to be found in some older gardens.

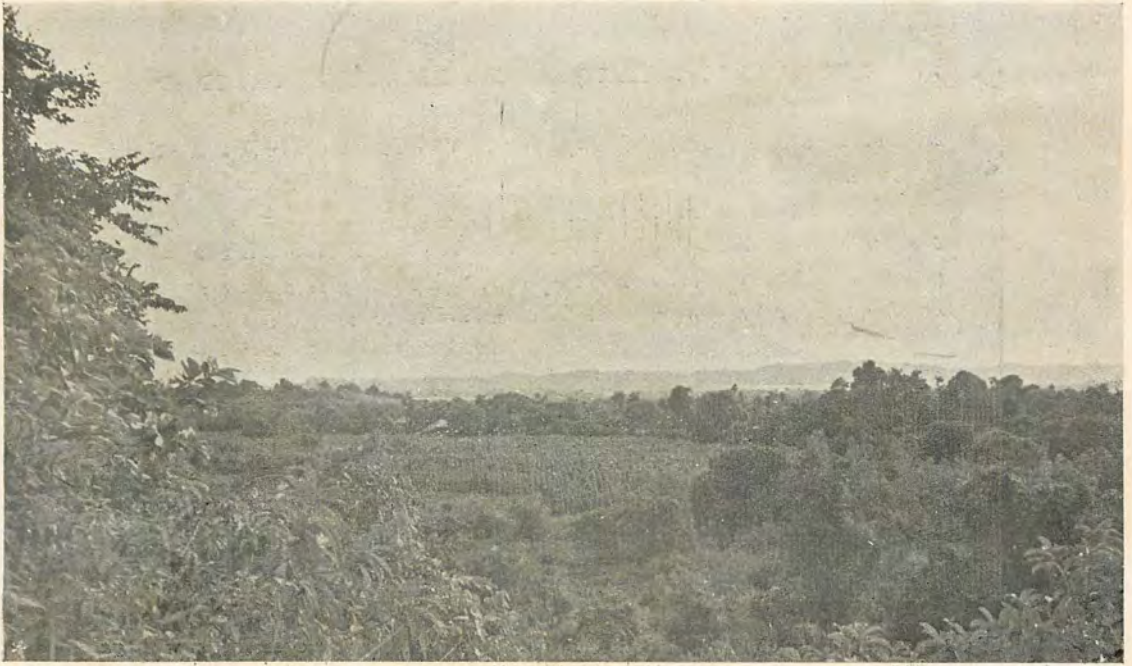


Fig. 1 General view looking West from Khao Ngua hill at Tamai, overlooking the red soil region, described in the text, where pepper is extensively cultivated. Pepper gardens are seen in the centre.



Fig. 2 The infertility of the red soils is well illustrated here—a part of the open land described in the text. *Crotalaria* had been grown as green manure in between Derris, all over the area. *Crotalaria* seedlings after germination remained so very stunted that they are hardly visible in the above illustration, except for the two clumps which happened to be on the spots where a lot of brush wood growing there had been burned.



Fig. 3 Preparing the land. This is in the red soil region; the plot over grown with *ya kha*, lalang grass, (*Imperata arundinacea*) In a case like this one deep digging is advisable, thereby eradicating the lalang completely. In the righthand corner is seen the soil free from the rhizomes of lalang and the man standing in the furrow shows the depth to which the digging is done.



Fig. 4 The pit for planting the cuttings. Note the rectangular opening. In the left hand corner is the prepared earth *i. e.* a mixture of burned earth and dung. On the opposite side is the stake, fixed into the soil when the position of the planting holes is marked out. The dug out earth is seen on the farther side of the pit.



Fig. 5 The prepared cuttings. Note the nodal roots.



Fig. 6 The fern leaves used as shade for pepper cuttings.



Fig. 7 Watering the pepper cuttings.



Fig. 8 Digging or the earthing-up operation.



Fig. 9 Removing the bark from the temporary supports.



Fig. 10 Fixing the temporary supports.



Fig. 11 Training the young pepper vine on the support.



Fig. 12 The height to which the cuttings grow in twelve months; and it is at this stage that they are cut as seen in *Fig. 18*. Note the permanent hard wood posts by the side of the plants; to be fixed after the plants have been cut.



Fig. 13 This is what is left of the original plants after the vines are cut and removed.



Fig. 14 The vines removed from the original plants to be further utilized for making cuttings. Two cuttings could be prepared from each of such vines.



Fig. 15 The annual digging of the pepper garden as done usually during October before the cold and dry winds from the North.



Fig. 16 Watering the pepper plants during summer. Note the pit dug at the foot of the plant to hold the water. This is in the sandy soil region.



Fig. 17 Picking operation.



Fig. 18 The variety of pepper generally cultivated—Ban Cave.

