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THOMAS E. FURMAN, EDITOR.

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THOMAS E. FURMAN, EDITOR

«Ceiba» has been published in both Spanish and English since 1942. Its field is the Central American Republics, but consideration is given to technical papers in the broad field of biology and associated subjects appertaining to all those parts of Latin America which the Escuela Agrícola Panamericana serves.

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CEIBA

A SCIENTIFIC JOURNAL ISSUED BY

THE ESCUELA AGRICOLA PANAMERICANA

THOMAS E. FURMAN, EDITOR

TEGUCIGALPA, HONDURAS :: May 31, 1959 :: VOL. 8 - No. 2

A NEW MILLIPED FROM HONDURAS

H. F. Loomis [1]

In the early summer of 1958, Mrs. Paul H. Alcorn, whose husband was then on the faculty of the Escuela Agricola Panamericana, Zamorano, Tegucigalpa, Honduras, collected three species of millipeds at that school and kindly sent them to me for identification. Two were previously described species, not before reported from Honduras, while the third proved to be a new and handsome species it is a pleasure to name for the collector.

Orthomorpha coarctata (Saussure)

A male and two females of this tropicopolitan species collected in July.

Orthoporus absconsus Chamberlin

A male collected June 20.

The holotype from Costa Rica, and until now the only reported specimen, was a broken male of indeterminate length and number of segments. The present male has 65 segments and is 65 mm long and 3.5 mm in diameter. The head has the fine line of the vertex meeting the still finer one connecting the eyes in a small, rounded, and quite strongly depressed area; the clypeal region has 5 or 6 *strongly* impressed, longitudinal channels of varying length. The dorsum of the posterior subsegments is "cross ribbed" in and immediately behind the transverse sulcus.

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[1] Miami 56, Florida.

Chondrodesmus alleni n. sp.

Three males and a female collected in July 1958.

Diagnosis:— This relatively small and broad species is the only member of the genus having the dorsum between the lateral keels solidly black, or the anterior border of the first segment slightly undulated. Swollen second joints of the four pairs of legs preceding the male gonopods have not been reported for another species.

Description:— Body widest at second segment, from 5 to 5.5 mm broad and from 30 to 31 mm long.

Color of dorsum uniformly black with the lateral carinae outwardly wholly bright lemon yellow in the female but in the male with the yellow area reduced and extending obliquely inward and backward from the anterior corner to include most of the posterior margin; last segment with only the tip yellow; head, antennae, legs and sternal areas reddish brown.

Head with a very strongly depressed median furrow extending upward from between the antennae, its upper third but faintly impressed across the crest of the vertex.

First segment (Fig. 1) relatively short and broad, over three times as wide as long; anterior margin faintly emarginate on each side at a point a third of the way to the rather sharp lateral angle; posterior margin with median portion broadly and definitely emarginate, the outer portion on each side straight but oblique.

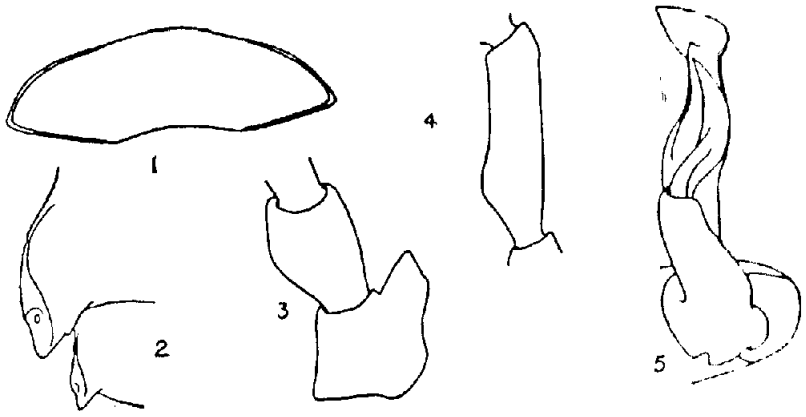
Second segment with posterior corners less than a right angle, those of segment 3 approximately square while those of segment 4 are slightly more obtuse and more rounded. Segments 3, 4 and 6 usually with a very small tooth at the anterior corner of the keels. Segment 18 usually with a small angular projection on the posterior margin of the keel near the produced corner (Fig. 2). Preanal scale similar in shape to that of *C. singularis* Chamb., illustrated in Proc. U. S. Nat. Mus., 18, art. 10, pl. 16, fig. 13, 1922, although that species differs in other particulars. Pore opening obliquely upward from a pronounced swelling behind the middle line on the anterior segments but further back on

ensuing ones. Surface of segments coriaceous and without distinct tubercles in transverse rows on the anterior segments, but toward posterior end of body a rather definite row of small tubercles may usually be seen near the posterior margin, a less distinct row a little in front of it, and an indefinite row of fewer and still smaller tubercles considerably in front of the second row.

Shape of gonopods (Fig. 5) typical of the genus and most closely resembling those of *C. granosus* (Poc.), as figured in the Biologia Centrali-Americana.

Secondary sexual characters of the male include the process on the coxal joint of the second legs being acute at apex with the opening on an oblique inner face (Fig. 3), third joint of legs 4 to 7 inclusive with basal half swollen on the ventral side (Fig. 4); second joint of legs behind the gonopods with a small tooth at apex on ventral side, especially on the posterior half of body.

Male type and female paratype deposited in the U. S. National Museum.



A NEW GUIDE TO LAND USE PLANNING IN TROPICAL AREAS [1]

by

J. R. Hunter [2]

One of the effects of the rapid rise in world population has been an attempt by individuals, by governments and by organizations of international scope to make better use of available agricultural land. This has either taken the form of improving practices in areas already under cultivation or by bringing heretofore unused land into cultivation. When careful thought and planning was given to improving new practices or bringing new land into cultivation, a modicum of success was guaranteed. Usually, however, the exigencies of the market or a particularly attractive practice in another country has determined the type of land use. This sometimes led to failure as in the spectacular case of the "Groundnut Scheme" in Africa (49).

A great many land use plans have been or are now being made for many parts of the world. An example of this is the work of the Regional Meeting on Land Utilization in Tropical Areas of Asia and the Far East held in Nuwara Eliya, Ceylon, in September of 1951 (24). Quite a few plans have been published for areas in Central and South America (19, 21, 23, 25, 32, 44, 45, 46, 48). Most of these plans are either empirical in nature (mapping of actual land use) or are based on conditions existing either in northwestern Europe or North America. Such plans do not always fit the needs of the tropics where we find the majority of the so called under-developed or lesser developed nations of the world, where proper land use is of prime importance.

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[1] Approved by the Publications Committee, Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica.

[2] Project Leader, Coffee & Cacao Technical Services Unit, Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica

In order to make the best use of the natural environment, all of its separate yet interlocking factors should be known. When the temperature, rainfall, topography, altitude, soils and related factors of a given location have been determined, definite recommendations can be made as to the best type of vegetation to be grown in that area. In his paper, "The determination of world plant formations from simple climatic data", Holdridge (13) has one of the most exact and complete plans now in existence for determining, classifying and correlating the plant ecology of the different dry land areas of the world. Holdridge's scheme of ecological classification, the key to which is presented as Figures 1 and 2, has been found, among other things, to be an excellent basis for land use planning (20). This guide is based upon this classification and is presented with the hope that it can aid in planning the best use of land in other tropical regions, since the so called "Forest Formations" in other land areas which are the same as those of this present guide, can be put to the same general land use. Only the principal "Forest Formations" encountered in the tropics will be dealt with. As might be expected, these formations are all relatively close to the line where evaporation equals precipitation (Fig. 1) with a tendency, however, to extend into those formations where more rain occurs.

The classification is based upon the principle that different species of plants have different yet definite edaphic and climatic requirements in which the climatic usually overshadows the edaphic, in the broad sense. In this case, the climatic factors are the combination of temperature, rainfall and evaporation. The knowledge of the ecological factors present in each formation gives us a definite guide to follow in determining what are the best types of land use to be carried out in underdeveloped areas and whether, in the more developed areas, the existing form of land use should be maintained and encouraged or changed to some more suitable form.

The system is really quite simple yet ingenious. All that is required is temperature and rainfall data. To a certain degree, elevation may be substituted for temperature (Fig. 2). Actually, the information contained in a number of issues of the monthly newsletter "Focus" (42) of the Amer

ican Geographical Society is sufficient. Issues devoted to Nigeria, Angola, Kenya, Ethiopia, Colombia, Sierra Leone, The Sudan, Madagascar, Cuba and Mozambique all have enough data to make a rough ecological map of the country involved which could then be used as a basis for accurate planning.

This system is more exact and less cumbersome and much more easy to work with than the system explained by Standley (40) and Popenoe (33) of equating the temperature zones of "tierra caliente", "tierra templada" and "tierra fría" with wet, semi-arid and arid rainfall zones.

The examples presented in this paper are taken mostly from tropical America. This is due principally to the author's familiarity with this particular area but also to the fact that maps, based upon Holdridge's classification have already been prepared and published for Costa Rica (15), Guatemala (18), El Salvador (14), Panama (17), Peru (43) and parts of Venezuela (16).

As each formation is a definite and distinct ecological entity, it will be dealt with separately. It should be understood, however, that the lines of demarcation between these various formations are not strictly exact and that allowances must be made for variations between formations. Furthermore, these formations are based primarily upon climatic factors with the result that considerable variations in associations of different types of vegetation will be noted as the edaphic factors change. In the same formation, different species will be found on the better soils than on the poorer soils. As yet so little work has been done in this field that a more exact classification, based upon the differences in the soils encountered, is not possible at this time. Actually, soil surveys of these tropical areas are an extremely necessary adjunct to a guide such as the present one; however, as only a few limited areas including Cuba (3), parts of Costa Rica (8), Puerto Rico (36), the British West Indies (10) and other small sections of Latin America have actually been completely classified, this will have to await a future date.

A. SUB ALPINE FORMATION

Moist Páramo: This formation is found throughout the whole Andean chain in South America above the tree line (about 3,000 meters or 10,000 feet), but only in very limited areas in Central America. It makes up a great part of the "altiplano" areas of Ecuador, Peru and Bolivia. In Costa Rica, for example, there are only about 1,000 hectares or 0.02% of the total land area of the country. The average annual rainfall is between 250 and 500 mm yearly (10" — 20") and the average annual temperature is between 3° and 6° Centigrade.

Although this formation is found between the Tropic of Cancer and the Tropic of Caprioorn it can not be considered as being tropical in any sense from an agricultural point. It is used almost exclusively for grazing.

B. MONTANE FORMATION

Wet Forest: This zone is restricted to the high mountain areas at elevations ranging between 2,500 or 2,600 meters (8,250 feet) and the lower limits of the Páramo formation. It is typified by an average annual temperature range of between 6° and 12° C. and an average annual rainfall of between 1,000 and 2,000 mm (40" — 80"). At a lower elevation this amount of rainfall would place the forest in a dryer belt but with the lower temperature at this elevation, there is less evaporation and therefore it is in a wet belt.

The land use of this belt should be limited almost exclusively to pastures and forestry with certain areas set aside for recreational purposes. This latter would include such localications as the land in the immediate vicinity of certain volcanos which could be made into national parks. In Mexico *Abies religiosa* and in Guatemala, *A. guatemalensis* grow in this formation and as the name of *A. religiosa* implies, can be used for Christmas trees. According to Holdridge (1) *Weinmannia pinnata* grows well in Central America at least, and is a fair timber species. One of the better known called jaúl in Costa Rica---*Alnus jorullensis*, grows throughout Latin America in this formation. It does as well on the [illegible] between La Paz and Las Yungas in Bolivia

along the highway between Cartago and San Isidro del General in Costa Rica. Actually in the latter country it is planted in combination with such pastures as orchard grass *(Dactylis glomerata)*, Italian ryegrass *(Lolium multiflorum)* and a number of clovers *(Trifolium spp., Lotus spp.* and others) (1). These grasses benefit not only from the shade but also from the nitrogen fixing properties of the Jaúl.

In any case both the forests and pastures must be properly managed for otherwise the bamboo *(Arundinaria viscosa)* will quickly dominate the openings in the original forest cover as I have seen them do in both Bolivia and Costa Rica rendering the areas completely worthless.

It is probably too cold and humid for any form of agriculture.

C. LOWER MONTANE FORMATION

Savanna or Dry Forest: This zone is found at elevations of between 1,500 and 2,500 meters (5000 and 8250 feet). Rainfall averages between 500 and 1,000 mm (20" — 40") per year and the annual average temperatures range between 12° and 18°C.

This formation has considerable agricultural importance but due to its similarity to temperate agriculture, such crops as potatoes, wheat, barley and corn (maize) being grown, no radical changes in use or management need be recommended. Many organizations such as the Rockefeller Foundation (11) have been quite successful in developing new varieties of the crops for Latin American conditions using recently developed agronomic techniques. Extension Services in many countries have been distributing both the improved seed thus developed as well as information on crop management to the farmers of this area using techniques learned first hand from the United States Extension Services.

An interesting recent development and one which can probably be utilized in other Lower Montane Dry Forest formations has been the planting of *Eucalyptus* as a timber species. This tree, which often needs irrigation in this formation to get started, produces extremely well and is hi-

used with success for mine timbers in many parts of South America.

Moist Forest: This formation is limited to the same altitudinal belt as the Dry Forest formation and has the same temperature range but receives an average rainfall of between 1,000 and 2,000 mm (40" — 80") per year.

In Central America it has been listed as a dairy belt (12). Actually, on the better soils, in addition to permanent and cut pastures it is exceptionally well suited to the growth of certain horticultural crops. Of all of the areas in which potatoes are grown, this is probably one of the best due to more favorable moisture conditions. In addition to the field crops mentioned in the previous formation which will also do well here, many leafy horticultural crops including lettuce and celery can also be grown with success.

On the poorer agricultural soils and those where the topography is more severe, silviculture should be practiced. At the present time, some of the more progressive farmers in this formation are combining pasture and forest management especially in the use of windbreaks, usually with ciprés *(Cupressus lusitanica)* as well as the Jaúl — pasture combination already mentioned under the Montane formation. Pastures in this formation may include Kikuyu *(Pennisetum clandestinum)*, Elephant grass *(Pennisetum purpureum)*, Imperial grass *(Axonopus scoparius)* and others.

Wet Forest: This zone is similar to the preceding two with respect to the altitude and temperature but receives an average annual rainfall of between 2,000 and 4,000 mm (80" — 160").

This is also a good dairy region and here too potatoes, oats and a variety of horticultural crops can be grown successfully. The higher rainfall is a definite drawback for certain crops, however, as under these conditions of high moisture there is a corresponding high incidence of such diseases as *Phytophthora infestans* in potatoes. *Brassicas* such as cauliflower, broccoli and cabbage as well as celery and lettuce do very well in this zone.

These cultivated crops should be limited to the more level land unless careful conservation measures are applied

Actually, since there are not a great many areas of level land in this formation, pastures and forestry constitute perhaps the best land use. The jaúl-pasture grass combination already spoken of is excellent in this zone as well. A proper rotation of these trees can easily be planned so that a sustained harvest of the lumber can be attained while maintaining permanent pasture.

The pasture grasses mentioned as being well adapted to the Moist Forest Formation of the Lower Montane formation do well here too but more investigations are indicated to determine what other species, especially legumes, can be utilized. In addition to new varieties, such practices as the use of fertilizers are strongly recommended. Almost no chemical fertilizers are in use at present.

The use of salt and other mineral nutrients for the cattle themselves is a necessary adjunct to good pastures. The milk production from land already under cultivation could be increased and is highly essential. According to May (25), in Costa Rica for example, the average consumption of milk per capita per day is only a fifth of a pint as compared to a pint in the U. S., and Costa Rica is considered as having a fair dairy industry. Increased production per animal unit would also help the individual farmers in their present price problems as regards dairy products.

Wind is often a problem and for this reason the extensive use of shelter belts is advocated. These belts will not only serve to prevent wind damage but also should provide a good quantity of posts, poles and lumber. At the present time, ciprés is being used here as well as in the Moist Forest Belt. Introductions of other trees such as Douglas fir *(Pseudotsuga taxifolia)* and California redwood *(Sequoia sempervirens)* are now in progress and should be continued and augmented.

In addition to these so called dual purpose trees, a number of other excellent timbers are native to this area and their management under forest conditions is recommended. The famous oak forests of Costa Rica are found here with *Quercus oocarpa* at the lower edge of the formation and *Q. copeyensis* at the top of the belt. Together with these are such other valuable species as llorón *(Cornus dis-*

ciflora), cedro dulce *(Cedrela tonduzii)*, cas *(Persea schiedeana)* and several species of the Lauraceae family.

Pastures, forestry and such recreational areas, including National Parks, as are deemed advisable to provide for recreational facilities for rapidly increasing populations in this area, are also of importance in providing proper watershed protection. In areas where a dry season occurs, water is becoming an increasingly serious problem. As a great deal of the water used in industry, for urban use and for hydroelectric power originates in the Lower Montane formations, the land use of this area should be coordinated to provide the best conservation of this resource. Indiscriminate cutting and burning of the forests as is typified throughout Central and South America should be discouraged by whatever means possible. There is no doubt that fire is a worthwhile tool at times but not in the way it is most often used. Properly managed forests, in which the poorer species are used for charcoal and the better species for lumber, are recommended.

Rain Forest: This formation, as the three others in the Lower Montane belt, is located between 1,500 and 2,500 meters (5000 and 8250 feet), has an average annual temperature range of between 12° and 18° C. but receives far more rain. The average annual rainfall is between 4,000 and 8,000 mm (160″ — 320″).

Due to this high rainfall, which occurs the year around, and coupled with a topography which is usually quite severe, the best land use is in properly managed forests. It is too wet, cloudy and cold and the soils too easily leached and eroded for any form of agriculture, with the exception of pastures, to be recommended. Pastures, which should be maintained on the more level or undulating land, may be planted to the same species as in the other belts of this formation and should be in the least humid areas.

The previously described formations, although located in the 'tropics" are quite "temperate" in nature and temperate type agricultural systems can be carried out here, usually with success. As has been mentioned, it is in these formations that temperate techniques such as the organi- [illegible] of Agricultural Extension Services in many Latin

American countries find their greatest success. It is only when we deal with the Sub Tropical and Tropical Formations that we encounter problems which are essentially distinct and different from "temperate type" agriculture. The formations which follow are those which require special attention for it is here that agricultural planning needs a new and different approach.

D. SUB TROPICAL FORMATION

Savanna or Dry Forest: This formation is to be found at elevations which begin at about 500 or 600 meters on the Atlantic slopes and approximately 700 meters on the dryer parts of the Pacific slopes of the western hemisphere and run up to an elevation of 1500 meters above sea level (1700 to 5000 feet). Temperatures average between 18° and 24° C. on an annual basis and the average annual rainfall is between 500 and 1,000 mm (20" — 40").

For any type of cultivated agriculture, this formation often needs some kind of irrigation as is practiced successfully in certain intermountain valleys in Peru and any Formation dryer than this one *must* have irrigation water to have any type of agriculture at all outside of very extensive grazing.

In southern Mexico, in large areas of Central and Southeastern Guatemala and in a small section of northwestern Salvador, the Indians have learned to conserve water and plant with the rains. Their principal crops are corn, beans and cucurbits chiefly squash and pumpkins. According to Sauer (37) this has been the type of agricultural practice for centuries. It is a kind of tropical dry land farming and is the only type of cultivated agriculture which can be carried out unless irrigation water is available. In Africa this same type of farming is carried out sucessfully with the exception that sorghums *(Sorghum vulgare)* and millets principally *Pennisetum typhoideum* are commonly used. These two grasses might well be given further trials in the New World.

Few of the original forests, which were not very productive of good timber, remain and outside of the dryland

type of cultivated agriculture indicated above, the best use of this land is in pasture.

In many locations attempts are made to grow coffee in this formation. Even in those areas where rainfall approaches 1,000 mm per year, however, the chief problem encountered in coffee culture is lack of water. Attempts are made to mulch, shade, plant windbreaks and so on but there is no escaping the fact that this is not a good formation for the growth of this crop. It is extremely marginal and the cultivation of coffee in this formation should be discouraged. Kenya is an excellent example of an area where despite good research and energetic attempts to establish this crop it is usually not at all successfull except in those areas near Lake Victoria where there is a high enough rainfall to throw the area into the following formation.

Moist Forest: This formation, which is at the same elevation and has the same temperature range as the previous one receives twice as much rainfall. The average annual rainfall ranges between 1,000 and 2,000 mm (40" — 80"), and is usually characterized by a wet and dry season.

This formation is by all means the best formation for arabica coffee *(Coffea arabica)*. From a climatic standpoint this is true throughout the world. Sylvain (41) has indicated that the original coffee forests of Ethiopia lie for the most part within this formation. However, coffee is recommended in this formation only in those areas where first class soils are to be found. In Central America, for example, this would include areas of recent volcanic origin. These may be found in the vicinity of David, Panama; Heredia, Costa Rica; Santa Ana, El Salvador; and Cuilapa, Guatemala. However, under proper soil management practices, one of the most important of which is the use of fertilizers, excellent coffee can be grown in certain other localities in this formation where the terrain is suitable. The use of fertilizers is advocated even on the better soils as well since results in Costa Rica (31), Hawaii (5) and Brazil (2) have indicated high increases in coffee production following the judicious application of chemical fertilizers. A large portion of Honduras is located within the Sub Tropical Moist Forest Formation but the soils are so poor that the

cannot be recommended for coffee and can only sustain the growth of the slash pine *(Pinus oocarpa)*. However, this is not poor land use for this timber not only finds many local uses but is being exported to El Salvador.

Tea is also grown successfully in this formation throughout the world. Brazil, Peru, Bolivia and Guatemala are countries in the Western Hemisphere which have tea plantations in this formation.

In addition to tea and arabian coffee, the best use of land in the Sub Tropical Moist formation is in intensively cultivated horticultural crops such as peanuts, pineapples, tobacco, tomatoes, peppers, onions, citrus fruit, mangos, avocados and so on.

All agricultural extension and research in connection with this zone should be directed towards the crops indicated above. Field and pasture crops can be grown but probably will not make as good a return over the long run as these horticultural crops. In addition to the pine forests in Honduras forestry is practiced to a degree on all coffee farms, as the prunings from the shade trees provide thousands of cords of fuel wood annually. However, this is one area in which it is not generally recommended as a good practice since very few timber types are encountered here; Ciprés *(Cupressus lusitanica)* being probably one of the very best species (9).

One of the major problems for this highly productive zone is that of its high concentration of population. From a climatic standpoint people most enjoy living where precipitation equals evaporation and the average temperatures hover around 20° C. (70° F). In Costa Rica approximately 65% of the people of the country live and work in this formation which contains less than 10% of the total land area of the country. In El Salvador, the figures may be even greater. Although coffee, tea and the various horticultural crops indicated require a great deal of hand labor, the present pressure upon the land is such that many of the better farms, especially in the vicinity of the larger cities and towns are being converted into residential areas. This is naturally very poor land use and provisions should be made to encourage emigration to other areas as well as to see that

future residential areas are located on the poorer agricultural soils.

Wet Forest: Temperatures and elevations are the same as in the previous two formations. Rainfall ranges between 2,000 and 4,000 mm (80" — 160") yearly.

With the exception of the fact that this area receives a high rainfall, the cropping system on the best soils (volcanic) can be similar to that of the Moist Forest Formation. For example, the coffee lands on the western slopes of the volcanic chain in Guatemala are in this formation. Much good coffee is also grown in this zone in Costa Rica and Colombia. As the rainfall increases from 2,000 mm to 4,000 mm there is a corresponding need for better soils and a corresponding need for more conservation work, if agriculture is to be properly practiced. In addition, in areas of higher humidity, greater attention must be paid to disease control measures as diseases such as "ojo de gallo" *(Mycena citricolor)* thrive under humid conditions.

In many countries, particularly Guatemala and Costa Rica, areas within this formation and the Moist Forest formation as well are planted to sugar cane. This crop is not recommended here and should be planted in the Tropical Formations which will be discussed later. Despite this stricture, it will of course be grown and will probably replace some coffee due to the present price of that crop, but plans should be made for the future when it will be less economical to grow cane here. These plans should include the replacement of cane by certain of the crops mentioned above.

On the more undulating land, pastures can constitute a good land use although they are not strongly advocated. In any case they should be fertilized (an extremely limited practice at present) with manure or chemical fertilizers as the soils in this area, subject as they are to high rainfall are easily leached and eroded.

Of all the formations in the Sub Tropical Formation, this is by all means the best from the standpoint of forestry with many different *Lauraceae* species growing well. In addition, ciprés which has been previously mentioned finds this a good formation for lumber production.

Rain Forest: This formation occurs at the same elevations and temperature ranges as the previously mentioned formations in the Sub Tropical belt but the rainfall is between 4,000 and 8,000 mm (160" — 320") per year.

The studies of Reark (34) have shown that the formation occurs in Costa Rica although due to lack of sufficient climatological data its boundaries are not indicated on the ecological map. Tosi (43) has outlined the areas of occurrence in Peru.

Due to the extremely high rainfall, this zone is quite unsuitable for most types of agriculture. Forestry is the best land use possibility.

E. TROPICAL FORMATION

Savanna or Very Dry Forest: This belt rises from sea level to approximately 700 meters (2300 feet) and average annual temperatures range above 24° C. It receives between 500 and 1,000 mm (20" — 40") rainfall annually most of which usually falls during one period of the year locally called "invierno" or the rainy season.

Many areas of this formation are be found along the Pacific coast of Central and South America particularly in Mexico and Peru. It is also to be found in the Yucatan in Mexico, in the southeastern part of Cuba and along the north coast of Venezuela.

From the standpoint of agriculture, the lack of water is a decidedly limiting factor. Where river or sub-surface water and the desired topography and soils are present, irrigated agriculture can be practiced to great advantage; the principal crops should be cotton and sugar cane. Usually, however, the pattern is one of extensive grazing, including the use of sheep and goats which can soon become a most unpractical form of land use. In Mexico, the cultivation of various *Agave spp.* for their fiber is practiced in this formation. In Africa, millets and sorghums, previously mentioned, grow well when planted with the rains.

A number of leguminous trees do well in this formation. For example, quite a few varieties of *Leucaena glauca* are to be found in the Yucatan alone and the pods and foliage of this tree provide an excellent forage for cattle (not for

horses as it causes their tails to fall out). In other parts of the world, principally Africa, gums and resins are collected from certain leguminous trees of this formation, Gum Arabic from *Acacia Senegal* being perhaps the best known.

Dry Forest: This Tropical formation has all of the physical characteristics of the Savanna formation with the exception that it receives more rain. Between 1,000 and 2,000 mm (40" — 80") of rain fall on this formation yearly.

Large areas of this formation are to be found in all parts of Latin America between the two tropics. The Amazon basin, usually thought to be one where a very high rainfall is encoutered, actually contains large areas of Dry Forest in Brazil, Peru, Bolivia and Colombia.

In Central America most of this formation is to be found along the Pacific side and practically all of the island of Cuba may be classified as Tropical Dry Forest.

From an agricultural and economic standpoint, parts of this formation were formerly limited and isolated by lack of transportation. The produce of these areas was either floated down rivers, as in the case of lumber, carried out by pack or else, in the case of cattle — walked out to the nearest market. For this reason, except in those areas with good transportation, this formation persists as range country, the Beni region in Bolivia being an excellent example.

One might think that, owing to the extended dry season encountered within this zone and the multitude of problems which result from this lack of water, the propriety of cattle raising in this area be questioned. According to de Alba (6), however, this is one of the best formations to be found in the Tropics for cattle raising.

The land which is now in pastures is usually in such grasses as Jaragua *(Hyparrhenia rufa)*, pará *(Panicum purpurascens)* and Guinea grass *(Panicum maximum)*. The management of these pastures is usually quite poor. No fertilizers are used, there are seldom the proper number of animal units per area; uncontrolled burning is frequently practiced which has tended to reduce the productivity of the land year after year (2,4). The proper rotation of pastures as well as good breeding and management of cattle is seldom practiced, due as often to lack of fence as to lack

of knowledge. Besides poor range management and poo breeding practices, such factors as disease and insect con trol, castration, proper calving time, the use of salt anc mineral feed supplements are the exception rather than the rule. The production of beef per animal or per unit area is extremely low, principally due to the fact that these more modern practices have not yet been put into general use. Without a doubt, far more cattle could be raised on the land now in pasture or range and by the same token, less land would be needed to produce the same quantity of beef now required by the growing population in Latin America. Cattle can and should be raised in this zone but the propriety of using first class soils for pastures is questioned. These soils can be used much more profitably in cultivated crops.

The areas of good level agricultural land with fertile soils which can be adapted to the use of machinery should be put to such field crops as corn, cotton, beans, sesame, rice and sugar cane. Sugar cane in this area will produce in less than a year and if properly managed will have a yield much higher than that now being grown in the upland areas. Actually the best sugar cane producing areas of the world including parts of Formosa (Taiwan), Hawaii, Cuba, the Philippines, Brazil and places such as Santa Cruz Bolivia are all within this formation.

Cucurbits especially watermelons do very well here but this is not a good zone for vegetable crops in general. This is an excellent area for a number of fruit crops on the other hand and Popenoe (33) describes a great number which do well including Guanábana *(Annona muricata)*, various kinds of citrus (which may have to be irrigated at times), Mangos *(Mangifera indica)*, Marañón *(Anacardium occidentale)* and Papaya *(Carica papaya)*.

In all areas regardless of the crop, conservation measures including the use of soil building cover crops should be used, especially during the dry season when high winds are usually prevalent. This and the use of fertilizers should be stressed as the land cannot be cropped continually without detriment.

In the more rocky and unlevel areas a return to forestry is indicated. Until they were burned or cut away, the forests in this area were the most productive of precious

woods in the whole tropics. Prior to exploitation the following species were found in quantity: Caoba *(mahogany) (Swietenia humilis)*, corteza *(Tabebuia chrysantha)*, pochote *(Bombacopsis quinatum)*, cenícero *(Samanea saman)*, cocobolo *(Dalbergia retusa)*, ron-ron *(Astronium graveolens)*, cristobal *(Platymiscium spp.)*, Guanacaste *(Enterolobium cyclocarpum)* and Primavera *(Tabebuia Donnell-Smithii (Cybistax Donnell-Smithii)*. Teak *(Tectona grandis)* which is an introduced species in Latin America also does well in this formation as might be expected.

In addition to these forest areas which should be managed for their lumber supply, this zone has long been a recreational favorite. Provisions should be made to establish game preserves to satisfy this important need as well as to provide bird and wildlife sanctuaries.

Burning, which has been mentioned, is quite prevalent especially towards the end of the dry season and should definitely be limited. Under certain types of land management, controlled burning may be considered a good practice but uncontrolled fires are eventually quite detrimental and a hazard to game. The regrowth of proper timber species in forests adjoining rangeland is also impeded. With a switch from extensive pastures to cultivated agriculture, properly managed forest land and above all — well managed pastures, this problem may perhaps take care of itself. Until it is definitely controlled by proper land use or by law burning will always present a problem.

Moist Forest: This formation comprises a very large portion of Tropical America and provides an important challenge to proper development by man. Again this belt is to be found from sea level to 600 or 700 meters and has an average temperature above 24° C. The average rainfall is between 2,000 and 4,000 mm (80" — 160") and there is a continued tendency towards a two season type of climate in certain areas but the usual trend is to have some rain throughout the year.

This formation unfortunately is being used at the present time more and more for livestock, at least in the western hemisphere. In almost all regions, pastures will remain green the whole year and problems of dry season feeding are thus apparently eliminated. Furthermore it is quite easy

to cut down the forest and plant grass and thus establish a farm without worrying about any other type of land preparation. The pastures mentioned previously of Imperial grass, Guinea grass, Pará grass and Tropical Kudzu *(Pueraria phaseoloides)* grow here on the better soils but pasture management becomes a problem soon after establishment, and even on the best soils, pastures are hard to maintain for more than about five years. Due to the high rainfall the grasses are usually so succulent that a cow will often have to consume over 100 pounds of grass to take in 30 pounds of dry matter. In additions, the material taken in is usually quite low in protein. This is just not good pasture land but too often, however, the "temperate" attitude prevails and instead of seeking a different agricultural system the usual attempt is to find some form of vegetation that will behave in the tropics as an alfalfa-brome grass mixture does in the north central part of the United States. This was never an area for grasses of the pasture type, for giant bamboos which are also grasses do well here, and it probably never will become one. Research should be directed, if the policy is to keep animals in the area, towards finding some product or byproduct, cacao pod meal for example (7), which can be used to feed livestock.

Tree or semi-permanent crops are strongly recommended for this formation. This includes bananas (several different varieties of *Musa)*, cacao *(Theobroma cacao)*, coconuts *(Cocos nucifera)*, abacá *(Musa textilis)*, Hevea rubber, African oil palm, *(Elaeis guineensis)* and such specialty crops as the breadfruit *(Artocarpus altilis)* and the pejibaye palm *(Guilelma utilis (Bactris utilis)*. Although many attempts have been and still are being made to grow *Coffea arabica* in this formation it is definitely marginal for this species except on certain excellent soils. The variety of coffee which should be grown here is of the "Robusta" type *(C. canephora)*. In new plantations, these so called tree crops can sometimes be intercropped with corn, yuca or cassava *(Manihot utilissima)* or some other root crop such as yam *(Dioscorea spp.)*, or sweet potatoes *(Ipomea batata)*, especially when the tree crop is young. The "milpa" or "ladang" system of a shifting type of agriculture has long been practiced here but with the exception of areas of

high fertility or good soils such as are to be found along the banks of rivers, cultivated crops should be discouraged, except as a temporary intercrop, in favor of a more permanent agriculture or one in which the "shifting" is well planned as in the "Bantu system" (2). In addition, increasing populations will no longer permit the extravagant use of land which is necessary under the "milpa" system.

The one cultivated crop which does well here is rice (29). It is the basis of diet for millions of people throughout the world who live in this formation particularly in southeast Asia. It is one crop which grows best in water and the climate of this formation is particularly favorable. More work should be carried on as to the best varieties and management of this crop in all parts of this formation throughout the world.

In addition to these semi-permanent or tree crops the really outstanding product of this region is lumber. For one used to temperate forests, the growth rate of trees in this zone borders on the fantastic. Balsa *(Ochroma lagopus)* can be harvested five to six years after the seed germinates, laurel *(Cordia alliodora)* reaches a profitable diameter in between 15 and 20 years (30) and cedro *(Cedrela mexicana)* is almost as quick growing. These, of course, are selected examples of primarily second growth trees but the variety and quality of timber species from the better soils of this formation cannot be overlooked. Under proper scientific management a forest in this region should be able to give a yearly financial return equal to or better than almost any other crop.

The major drawback to this zone is that people in general do not care to work and live here. There are a number of reasons for this among which is an ingrained idea that the region is too wet, hot and unhealthy; there are usually few means of communications; there are few schools and medical services and few towns of any size where trade and recreation can be found. The United Fruit Company (26) has shown that these disadvantages can be overcome. When the governments of this region are sufficiently interested in building up this area to construct roads, schools, medical services and so on the other factors will also be overcome. When these improvements are made and when proper tech-

nical services such as those which could be provided by Extension Service are keyed to the problems of the area so that people will best know how to manage their lands, the area should have a promising future.

Wet Forest: This formation includes those areas at the same temperature and elevation belts as before but where the rainfall is between 4,000 and 8,000 mm (160" — 320") annually.

Because of this amount of rainfall at this elevation, forestry is the best form of land use which can be recommended although the semi-permanent and tree crops such as bananas and cacao previously mentioned will do well in areas where the rainfall is near the 4,000 mm mark.

Timber growth in this formation is as impressive as in the previous formation with such trees as the giant ceiba *(Ceiba pentandra),* Cativo *(Prioria copaifera)* and others rising up to 100 feet above the forest floor. Cativo incidently is one of the few species which grows in pure stands. It is to be found along the banks of rivers in Central America. Usually there is a tremendously great variation in the number of different species. This in itself is a challenge, however, and more research should be directed towards the management and utilization of this type of forest. It is probably best described by Richards (35).

DISCUSSION AND CONCLUSIONS

This has been an attempt to describe a relatively simple yet exact method of outlining various ecological formations in the tropics which may then be used in proper planning of the best land use. A completely accurate plan of land use is not possible without an accompanying soil survey but since so few are now in existence this is not possible at the present time. As a matter of fact it will probably not be possible for some time to come as Kellogg 22) indicates that in a detailed soil map of the tropics there would be more local soil types than in all of the land outside. However, in any event, even without the accompanying soil survey this scheme is a much more accurate and satisfactory basis for planning than is mapping out present uses as is advocated by Stamp (37).

We should try to learn what does best on the different soil types in these different forest formations and then direct our efforts towards seeing to it that forests, cultivated agriculture or pastures, as the case may be, are promoted here. This points out the definite importance of soil surveys and these should probably be carried out at first with a strong basis in pedology rather than from a practical standpoint.

Another conclusion we may quickly draw is that forestry is an extremely important part of tropical land-use. At the present time there are few profesional foresters in the tropics who are in a position to carry out the necessary research and extension to properly develop (in some cases save) this resource. The obvious answer is for governments to formulate active forestry staffs to tackle these problems one of the first of which should be a scientific inventory based upon forest "associations".

Finally, if we are to properly develop these really tropical areas of the world to their fullest we must direct the attention of everyone involved from "temperate" type thinking to "tropical" type thinking even as to whether people should live in plantation type company towns (47). All agricultural research and extension should try to deal with the agriculture in these different formations as definite entities in themselves and not as some kind of modification of temperate type agriculture or forestry.

The proper use of this ecological scheme has proven to be very accurate and helpful, when applied in some areas of Latin America. It is certain that it can be just as accurate and helpful throughout the tropics.

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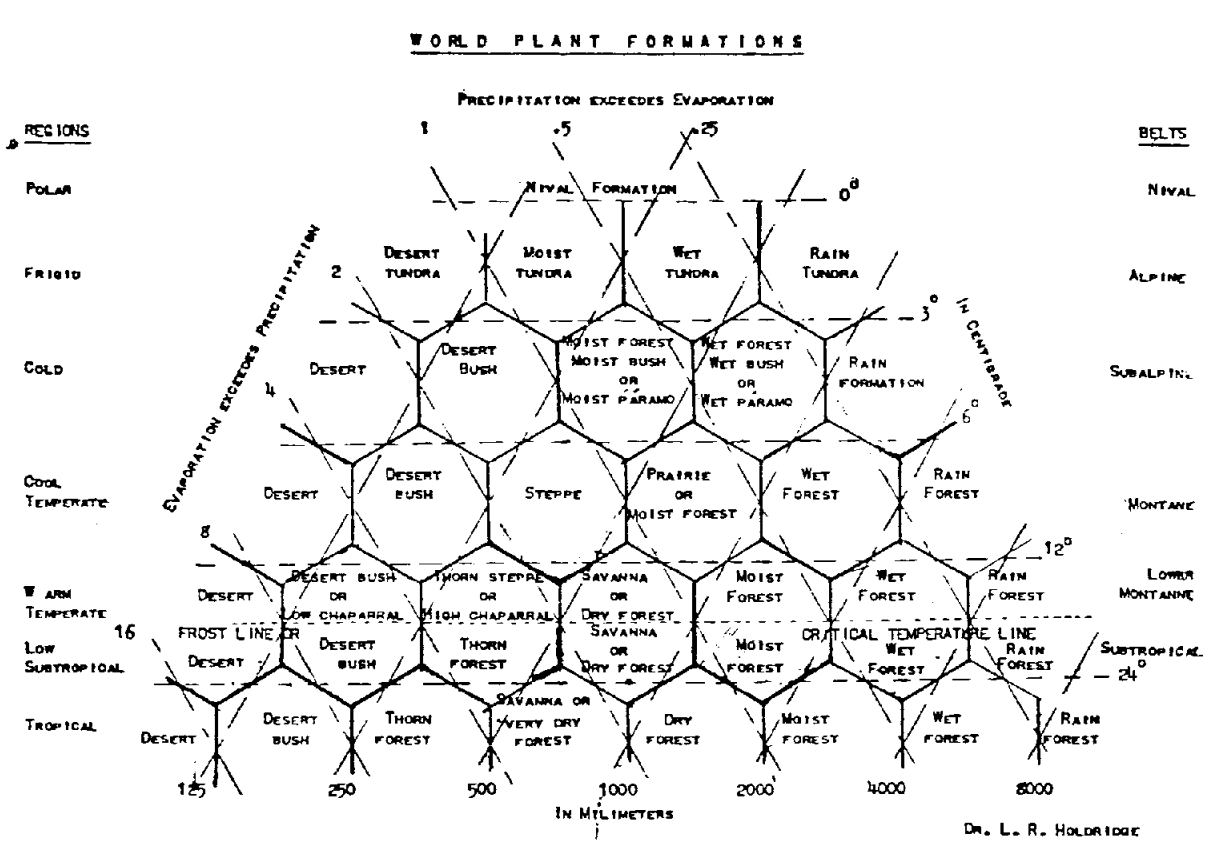
WORLD PLANT FORMATIONS
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EVAPORATION EXCEEDS PRECIPITATION
IN CENTIMETERS
REGIONS
POLAR
FRIGID
COLD
COOL TEMPERATE
WARM TEMPERATE
LOW SUBTROPICAL
TROPICAL
BELTS
NIVAL
ALPINE
SUBALPINE
MONTANE
LOWER MONTANE
SUBTROPICAL
NIVAL FORMATION
DESERT TUNDRA
MOIST TUNDRA
WET TUNDRA
RAIN TUNDRA
DESERT
DESERT BUSH
MOIST FOREST
MOIST BUSH
OR
MOIST PARAMO
WET FOREST
WET BUSH
OR
WET PARAMO
RAIN FORMATION
STEPPE
PRAIRIE
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MOIST FOREST
WET FOREST
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CRITICAL TEMPERATURE LINE
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THORN FOREST
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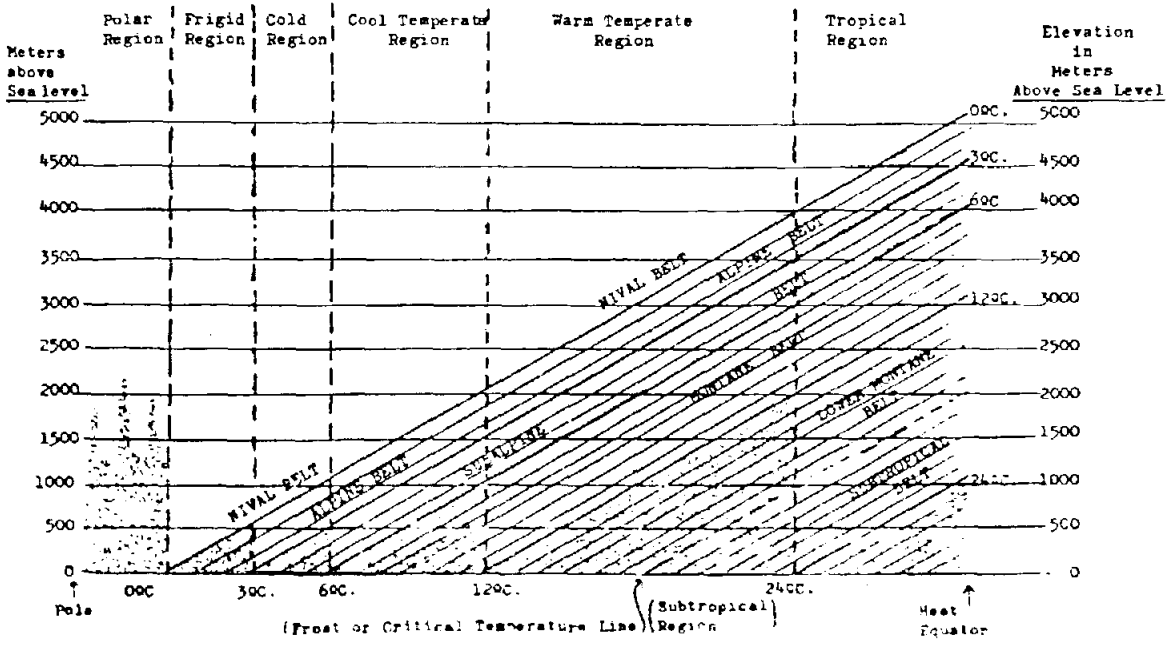
8000
IN MILLIMETERS
DR. L. R. HOLDRIDGE

Fig. 1.

Fig. 2. CHART SHOWING THE RELATIVE POSITIONS OF THE REGIONS AND ALTITUDINAL BELTS

(Portions of Regions below the Altitudinal Belts are stippled)



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EXTRACTOS DE INFORMES AGROPECUARIOS DE LA FAO

Noticias desde la Organización de las Naciones Unidas para Agricultura y Alimentación. FAO/59/3/2191. Reproducción autorizada.

REORGANIZACION Y AMPLIACION DE LA INDUSTRIA LECHERA EN EL SALVADOR

"Las vacas no habían visto jamás un piso de cemento, ni habían probado siquiera los concentrados, ni habían metido la cabeza en una cornadiza y, desde luego, no habían sido ordeñadas nunca sin tener los terneros al lado. Sólo dos personas habían ordeñado una vaca, e incluso esas dos casi se habían olvidado de cómo se hace. El Director de la Escuela no pudo estar presente, de modo que con el miedo del personal a las vacas y el de las vacas a todo, no fue poca la tarea del experto. No hubo más remedio que meter a las vacas en las cornadizas una tras otra enlazándoles los cuernos y arrastrándolas a la fuerza. Tuve que acabar de ordeñar a cada una cuando a los novicios se les cansaban los brazos y asimismo comprobar que se había sacado todo lo que la vaca estaba dispuesta a dar. Sin embargo, después de una semana de práctica, el personal aprendió a ordeñar bastante bien y las vacas se acostumbraron a la nueva rutina y el nuevo ambiente. En su mayoría se prestaron a ser ordeñadas sin estar presentes las crías. Una vez establecida suficientemente la rutina, se procedó a un recuento bacteriano y el resultado obtenido fue 1.400 cc., lo que demuestra que con un mínimo de medios, pero con una verdadera voluntad de limpieza no es difícil producir leche sana de buena calidad."

Esta cita está tomada de un informe del Sr. Robert Blodgett, experto americano en explotación lechera que trabaja en El Salvador por cuenta de la Organización de las Naciones Unidas para la Agricultura y la Alimentación

(FAO), con sede en Roma. Hace referencia a una escuela de "corraleros" establecida por el Gobierno de El Salvador a solicitud del experto en la Estación de Experimentación Agrícola de Izalco, al pie del volcán del mismo nombre no lejos de la frontera con Guatemala. Se construyó un nuevo edificio con dormitorios para los "estudiantes". Se organizaron tres clases de cursos: de 8 a 10 días para criadores de ganado, de una semana para asesores agronómicos y agentes oficiales de extensión y de 3 a 4 semanas para mayorales corraleros, que son los que normalmente tienen a su cargo la inspección de ordeño en las granjas lecheras. El programa de estudios para los tres cursos es fundamentalmente el mismo, pero se imparte con arreglo al diferente nivel intelectual de los cursillistas.

La instrucción de carácter práctico comprende cuidado y manipulación del ganado lechero, higiene de los edificios y del ganado, alimentación, ordeño, limpieza y esterilización de utensilios, registro lechero, partos, inseminación natural y artifical, ensilaje, preparación de concentrados y suministro de piensos para vacunos. La instrucción teórica se orienta a explicar la importancia del fomento de la producción lechera, exponiéndose asimismo los métodos que se enseñan en la capacitación práctica; cuidado de vacas, toros, vaquillas y terneros; síntomas de enfermedad, importancia de la alimentación controlada, composición de los alimentos, efecto de los diversos alimentos en la composición de la leche, alimentos empleados en El Salvador, agua y minerales, pastoreo y alimentación en locales cerrados, cría, etc. Como los métodos introducidos por el Sr. Blodgett no se habían aplicado nunca en El Salvador fue preciso instruir al personal y a la vez habituar al ganado.

Para prestar mayor interés al curso se efectúan proyecciones cinematográficas una o dos tardes a la semana, proyecciones de instrucción y esparcimiento al propio tiempo. Asimismo se organizan excursiones y vistas a lugares de interés. A final del curso se somete a cada estudiante a un examen oral y práctico, concediéndose un certificado a los aprobados. Se procura enaltecer el prestigio de éstos y de la Escuela exhibiendo tales certificados en las exposiciones agrícolas.

La creación de esta interesante escuela de corraleros ha sido posible gracias a siete años de esfuerzos encaminados a desarrollar la industria lechera de El Salvador.

Hasta hace unos cuantos años, la producción de leche revestía importancia secundaria en comparación con la de café, de algodón, de maíz y de caña de azúcar. De las 900.000 cabezas de ganado vacuno con que el país cuenta actualmente, unas 200.000 son vacas lecheras que dan un rendimiento de unos 2,4 litros diarios por cabeza, o sea unos 480.000 litros para una población de 2.300.000 habitantes. La importación de productos lecheros baratos procedentes de excedentes constituyó un factor adverso para el fomento de la explotación lechera hasta que se advirtió que la importación de productos excedentarios no podía traducirse en una situación estable, sobre todo en vista del aumento de la población, de los problemas monetarios y —factor de máxima importancia— del imperativo de un mayor equilibrio de la economía agraria. Ello tuvo por consecuencia que el Gobierno trazara un programa de fomento de la producción lechera, programa a cuya puesta en práctica han contribuido desde 1952 la FAO y el UNICEF. Por ejemplo, la FAO ha facilitado los servicios de un experto americano en economía agrícola, el Sr. Fritz Loenholdt, y los de un experto danés en organización de cooperativas lecheras, el Sr. Holmer Bendixen.

El primer experto destacado a El Salvador por la FAO fue el Sr. K.K. Jensen, técnico danés que efectuó extensas encuestas sobre la producción lechera en el país y coadyuvó a establecer una cooperativa de productores de leche en la zona de San Miguel. Esta cooperativa suministra la leche destinada a la central de pasteurización y leche en polvo que se construyó en la ciudad con la ayuda económica del UNICEF.

Se concedieron becas a técnicos lecheros locales para efectuar estudios en Nicaragua, Costa Rica, Europa y los Estados Unidos, a fin de que el proyecto constituyera un éxito

El Dr. A. E. Charpentier, técnico finlandés, sustituyó al Sr. Jensen en 1955, atendiendo principalmente a problemas relativos al mejoramiento genético del ganado lechero y a la producción de leche de calidad superior. Dicho

experto no tardó en advertir que el éxito de la industria lechera salvadoreña dependía en gran medida de que pudiera contarse con peones de granja lechera convenientemente capacitados, por lo que se dedicó especialmente a campañas educativas entre los productores y el personal de vaquerías. El Sr. Blodgett le sustituyó en 1957, prosiguiendo los trabajos con arreglo a iguales directrices. El Sr. Blodgett efectuó visitas a pueblos de la zona de San Miguel, realizando demostraciones sobre buenas prácticas de ordeño, dando conferencias sobre construcción de silos, sobre prácticas de alimentación y ordenación, etc. Este tipo de labor de extensión se vio coronado por el éxito en algunos casos. Por ejemplo, en un pueblo llamado Texistapeque, los productores decidieron organizar un concurso de ordeño como una de las atracciones de la feria regional. La puntuación de los participantes se basaba en la limpieza del ordeñador, la limpieza de la ubre de la vaca, el tiempo de ordeño, el carácter completo de éste y la falta de sedimentos en el filtro de algodón después de colar la leche.

Sin embargo, el Sr. Blodgett opinó que se imponía organizar sistemáticamente la capacitación de peones de granja, lo cual llevó al establecimiento de la escuela de Izalco.

Para mejorar aún más la labor que ha venido realizando, el Sr. Blodgett coopera actualmente con productores progresivos en el empeño de convertir sus explotaciones en modelos en que otros puedan inspirarse. En la primera granja en que llevó a cabo este tipo de actividades, se sacrificaron nueve terneros y unas cuantas terneras achaparrados. Al resto del terneraje se le enseñó a abrebarse en cubos, instruyéndose a los corraleros sobre el modo de adiestrar a los terneros. Se administraron concentrados y forraje picado a los animales, se procedió a lavar las ubres antes del ordeño y enseñó a los corraleros a lavar los utensilios manejados. Todo esto tuvo por consecuencia que la producción resultara casi duplicada. Extraordinariamente satisfecho de los resultados, el propietario se encargó de hacer publicidad de la labor llevada a cabo, lo que tuvo por consecuencia que se recibieran muchas solicitudes de asesoramiento y ayuda análogos. El Sr. Blodgett se dedica

actualmente a reorganizar otras diversas granjas sitas en zonas distintas. En la granja reorganizada se celebran jornadas de demostraciones prácticas, invitándose a los agricultores de los alrededores a comprobar los resultados obtenidos y al propietario a explicar los aspectos económicos de la reorganización.

A parte de las diversas fases del programa ya mencionadas, se ha realizado una gran labor para determinar la raza de ganado vacuno que mejor se adapta a las condiciones reinantes en El Salvador. El ganado criollo local es mestizo de ganado vacuno importado. La producción lechera del ganado criollo es baja, pero en cambio han desarrollado una resistencia elevadísima a las desfavorables condiciones imperantes en el país.

Desde que el Gobierno comenzó a fomentar la industria lechera del país, se ha registrado una tendencia a importar ganado lechero, pero hasta que los agricultores aprendan prácticas de alimentación y ordenación perfeccionadas malgastan su dinero a razón de 800 a 1.000 dólares por vaca.

Encuestas efectuadas por especialistas han conducido a la conclusión de que como el ganado criollo se ha adaptado al forraje de calidad inferior durante siglos de selección natural, puede producir tanta leche como los animales importados si es objeto de la alimentación conveniente. Los expertos de la FAO creen que las razas mestizas con un mínimo de tres octavos de sangre criolla serán a la larga las más aptas para el mejoramiento de la industria lechera de El Salvador.

LABORATORIO MUNDIAL DE CONSULTA SOBRE LA FIEBRE AFTOSA

Se ha dado un paso más en la lucha contra la fiebre aftosa con la creación de un Laboratorio Mundial de Consulta en el Instituto de Investigaciones (Viresis Animales) de Pirbright, Surrey, Inglaterra, como resultado de negociaciones entre el Gobierno del Reino Unido y la Organización de las Naciones Unidas para la Agricultura y la Alimentación (FAO). Durante algunos años, el Instituto de

Pirbright ha sido una gran ayuda para muchos países al examinar material procedente de focos de fiebre aftosa, con el fin de determinar los tipos de virus que se presentan en ellos. Fruto de esta labor ha sido el descubrimiento de cuatro tipos de virus diferentes de los encontrados en Europa. Con la asistencia de la FAO, se van a adoptar disposiciones para que los trabajos del Pirbright sean ahora extensivos a tantos países del mundo entero como sea posible. Ello conducirá a la obtención de datos más precisos sobre los factores relativos a la propagación de la enfermedad y a la distribución de los distintos tipos de virus. También existe la posibilidad de descubrir otros tipos desconocidos hasta ahora. Además de la aplicación de los principios generales que en la lucha contra las enfermedades infecciosas se ponen en práctica, la vacuna antiaftosa ocupa un importante lugar en muchas partes del mundo. Por ser varios los tipos de virus, tienen que emplearse vacunas preparada con el tipo o tipos predominantes en una comarca, así que es necesario conocer esos tipos predominantes. No se pretende que, en virtud de estas disposiciones tengan que emprenderse en Pirbright análisis rutinarios del material procedente de los países europeos. Europa dispone ya de facilidades para ello. El Instituto de Pirbright, sin embargo, prestará toda la ayuda posible cuando surjan dificultades.

También se encargará este establecimiento del examen y clasificación de los tipos y subtipos de virus, con objeto, en definitiva, de formar una colección de todos los subtipos confirmados, y de preparar un catálogo que irá en aumento a medida que se descubran nuevas cepas. Periódicamente se emitirán informes sobre la situación mundial a través de la FAO.

COORDINACION INTERNACIONAL CONTRA LAS ENFERMEDADES TRANSMITIDAS POR GARRAPATAS

En estos últimos años se han conseguido considerables progresos en el conocimiento de las enfermedades transmitidas al ganado por garrapatas. Simultáneamente, dadas las

mayores facilidades del tráfico ganadero, los riesgos de propagación de esta plaga o sus vectores a los países hoy exentos de ella han aumentado. De conversaciones sostenidas en diversas regiones del mundo con autoridades pertinentes se dedujo la necesidad de establecer consultas internacionales en el campo de la ciencia veterinaria. Como sede apropiada para tales consultas se señaló a la Organización de las Naciones Unidas para la Agricultura y la Alimentación (FAO), creada en 1946, con el preciso objeto de elevar los niveles de vida y nutrición de los pueblos mediante una mayor eficacia en la producción y distribución de toda clase de artículos agropecuarios y alimenticios.

Los animales domésticos, en todos los rincones de la tierra, pagan un oneroso tributo en forma de enfermedades que reducen notablemente el suministro de proteínas animales, esencialmente necesarias para el consumo humano. Al establecer el programa de trabajo de la Organización, los setenta y siete Estados Miembros de la FAO han conferido siempre primordial importancia a la lucha contra las enfermedades de los animales. Fiebre aftosa, peste bovina, brucelosis, perineumonía contagiosa, neumoencefalitis aviar, por no citar más, ocupan el primer plano en las tareas de la FAO. Son muy importantes los resultados conseguidos ya a través de la cooperación mundial contra estas plagas, bajo el patrocinio de la FAO y la Oficina Internacional de Epizootias (OIE). El conocimiento del importante papel que las garrapatas desempeñan como ectoparásitos, particularmente en las regiones tropicales y subtropicales, se remonta a la Edad Media. Pero fue en el siglo XIX cuando se descubrió que la garrapata era el posible agente transmisar de una gran variedad de enfermedades viróticas, bacterianas y otras de origen todavía desconocido. Pese a los extraordinarios progresos realizados durante los siete últimos decenios, los estudios sobre la transmisión biológica de las enfermedades por garrapatas distan mucho de ser completos.

Con vistas a un libre intercambio de información, la FAO y la OIE convocaron una reunión conjunta sobre la lucha contra las enfermedades transmitidas por garrapatas, que se celebró en la sede de la primera, en Roma, del 23 al 27 de julio de 1957. Participaron en esta primera reu-

nión veterinarios y especialistas de la Argentina, Australia, Colombia, Corea, Dinamarca, Egipto, España, Estados Unidos de América, Francia, Italia, Líbano, México, Nueva Zelandia, Países Bajos, Reino Unido, República Federal Alemana, Sudán, Turquía, Unión Sudafricana y Yugoeslavia, decidiendo crear un grupo de expertos e investigadores para que asesorase a la FAO y la ayudase en un libre intercambio de información sobre el problema de las garrapatas y las enfermedades transmitidas por las mismas. Este grupo está integrado actualmente por expertos de Alemania, Australia, Estados Unidos de América, Irán, Portugal, Reino Unido y Unión Sudafricana. El primer objetivo asignado a los expertos es el de acumular progresivamente todo género de nuevos descubrimientos en el campo de dichas enfermedades, indicando la deficiencia de conocimentos y las posibilidades de asistencia en orden a la investigación.

El grupo de expertos va a reunirse ahora, por primera vez, durante los días 24 a 29 de noviembre de 1958, en el Royal College of Veterinary Surgeons, de Londres. La información que esta reunión aporte, será integrada en lo que podrá considerarse como un primer informe del núcleo de un organismo internacional para combatir estas enfermedades y luchar por su posible desaparición. Se espera que los datos puedan ser utilizados para más adelante con el fin de levantar un mapamundi de la distribución del ácaro, que sirva a las autoridades veterinarias al formular e implantar medidas de lucha en el mundo entero. También desempeñaría este mapa la importante finalidad de combatir las enfermedades transmitidas por las garrapatas que pueden afectar al hombre.

LITERATURA

Alimentación del ganado en América Latina
Jorge de Alba. La Prensa Médica Mexicana. México, 1958. 337 páginas.

Hacía tiempo que se hacía sentir, en el ambiente ganadero latinoamericano, la necesidad de contar con una obra de Nutrición Animal que reflejara nuestra realidad

regional y enfocara nuestros problemas desde un ángulo real y práctico. Siempre nos hemos visto en la necesidad de resolver nuestros casos en base a consultas del clásico libro de Morrisson. Ahora, con el texto de de Alba, nos encontramos frente a una obra cuyas citas y ejemplos nos resultan más familiares y encuadrados dentro de nuestras posibilidades zonales.

No se trata de un libro de Nutrición avanzada, demasiado profundo y analítico, sino de un texto elemental, muy recomendable para el estudiante, el agricultor y todo el que se inicia en estas materias. Sin embargo, aún el más erudito, debería leerla en detalle, para aprovechar, al máximo, una serie de datos recogidos en nuestros países, con nuestros forrajes y nuestros propios animales.

El contenido se encuentra esquemáticamente distribuido. La exposición es clarísima y el lenguaje sencillo y preciso. Los rodeos son excepcionales y los problemas y las soluciones se suceden casi ininterrumpidamente. Los cuadros y las fotografías han sido bien seleccionadas y expresan, fehacientemente, las bondades didácticas del autor.

Quien busque muchos datos y explicaciones de tipo fisiológico o fisiopatológico de los problemas nutricionales, no los encontrará, ya que no es esta la finalidad del libro que nos ocupa. Si juzgamos la obra desde un punto de vista estrictamente científico, de conocimientos demasiado profundos sobre la materia, nos parecerá bastante elemental y que no tendría otro mérito que la cita de casos regionales latinoamericanos.

La bibliografía de los escasos trabajos efectuados en Hispano América, es bastante completa y nos permite comprobar, con verdadero desaliento, los contados intentos que nuestros especialistas han realizado para tratar de conocer, un poco más a fondo, nuestros propios problemas. Este libro invita a meditar un poco sobre lo que nos queda por hacer. La producción de forrajes, sus análisis químicos en los distintos períodos de crecimiento, cultivo, rendimiento, digestibilidad, palatibilidad, etc., son, necesariamente, diferentes de los de USA y si bien, considerar los valores norteamericanos es mucho mejor que ignorarlos, sería mucho más ventajoso para nosotros, contar con nuestras propias tablas. Si después resulta que los valores obtenidos, en nuestros pro-

pias experiencias, son muy semejantes a los de USA, tanto mejor, pero, en todo caso, estaremos más tranquilos y seguros y no pensaremos que a lo mejor nos estamos engañando a nosotros mismos.

Los beneficios a obtener, de cualquier trabajo experimental sobre la materia, está a la vista. Es inconcebible como, a pesar de sospecharse la existencia de numerosas áreas deficientes en algunos elementos minerales, especialmente fósforo, es poco lo que se ha hecho o publicado, que en realidad viene a ser lo mismo. Debemos aumentar el trabajo experimental y las publicaciones de sus resultados. A este respecto hay que evitar la falsa modestia que nos es tan común. Creemos que, aunque las conclusiones nos parezcan modestas, deben ser publicadas, por supuesto que siempre que se trate de un trabajo seriamente planeado y ejecutado. El problema del financiamiento experimental debe ser solucionado, hasta donde sea posible, en base al trabajo en las propias fincas de agricultores cuidadosamente seleccionados y que tengan especial interés en el problema a estudiarse. Si cada país intensificara un poco este tipo de investigación, ganaríamos todos y ya no tendríamos que actuar, tan a ciegas, en nuestros problemas de Alimentación del ganado. Este es el gran mérito de la obra de de Alba. Ha recogido la escasa y dispersa bibliografía que existe en Latinoamérica y la ha disectado, extrayendo la médula de todo lo que interesa. De Alba no cansa, no desmenuza innecesariamente, no pretende dar una sensación de erudición snobista, tan común en algunos investigadores y trata de poner, conceptos fundamentales de Alimentación, al alcance de toda persona con interés en la materia.

El Capítulo Primero trata de los forrajes, en general, y los divide en voluminosos o toscos y concentrados. Habla de los nutrientes, que éstos contienen. Es una exposición elemental, con una buena descripción del análisis químico de los forrajes, que suele confundir a nuestros ganaderos. Hace hincapié en la importancia de la calidad de la proteína para los monogástricos y de su importancia relativa en el caso de los rumiantes. Hay numerosas comparaciones con forrajes latinoamericanos.

En el Capítulo Segundo aparecen conceptos simples y claros sobre la función e importancia de los minerales. En-

contramos buenas tablas sobre el contenido mineral de nuestros forrajes. Se hace mención de áreas deficientes en América Latina, especialmente respecto a fósforo. También encontramos interesantes consideraciones sobre zonas deficientes en elementos menores. Luego figuran conceptos generales sobre las diversas vitaminas.

El Capítulo Tercero versa sobre digestibilidad y raciones balanceadas. Encontramos explicaciones simples e impecables de conceptos básicos de digestibilidad, coeficiente de digestibilidad y su importancia para las diversas especies animales. Aparecen las normas de alimentación, basadas en la cantidad teórica de materia seca, proteína digestible y elementos nutritivos digestibles totales, para mantenimiento y producción. Encontramos métodos fáciles y prácticos para balancear una ración.

El Capítulo Cuarto habla de los forrajes toscos y de su gran importancia en la alimentación del ganado. Se hacen consideraciones sobre el valor relativo de las tablas, debido a las grandes variaciones entre planta y planta, edad de las mismas, época del año en que se efectúe el análisis, fertilidad del suelo, abonaduras, etc. Se analizan las ventajas de usar fertilizantes. Encontramos valiosos datos sobre los pastos de corte, ensilajes, henos, etc.

En el Capítulo Quinto se trata de las praderas, de la importancia de la especie botánica predominante en ella, y de las variedades existentes en América Latina. Hay datos sobre manejo y mejoramiento de empastadas, rotación del ganado, renovación de praderas, etc. En este capítulo aparece un cuadro, bastante completo, con las características de algunas gramíneas y leguminosas comunes en Latino América, referentes a su adaptabilidad y usos principales como forrajes. Aparecen datos respecto a su nombre científico y común, tipo de crecimiento, adaptabilidad al clima, uso, tipo de reproducción, altura normal, etc.

El Capítulo Sexto versa sobre la alimentación práctica del ganado lechero, y en el que se analiza el problema de las fluctuaciones estacionales de producción, debido a las variaciones cíclicas de los rendimientos forrajeros y como el agricultor debe corregir estas deficiencias periódicas. Encontramos una buena tabla para determinar el porcentaje de proteína en el concentrado, para suplementar una ra-

ción de diferentes forrajes toscos. Aparecen diferentes mezclas de concentrados con varios porcentajes de proteína para diversos casos. Se habla del agua y de su importancia en la producción de leche. Sigue, a continuación, una descripción general de diversas experiencias con forrajes y concentrados comunes en América Latina, para determinar aquellos más recomendables por su rendimiento, digestibilidad, palatibilidad, etc.

En el Capítulo Séptimo se trata de la alimentación del ganado lechero en crecimiento. Se insiste en la importancia de criar los reemplazos en la propia finca. Encontramos una tabla sobre los aumentos diarios de peso satisfactorios para las diversas razas y los requerimientos nutritivos de los animales de diversos pesos, expresados en proteína digestible y elementos nutritivos digestibles totales. Aparece, luego, una buena descripción de los diferentes métodos de crianza de terneras, en las diferentes situaciones que suelen presentarse en nuestros países.

El Capítulo Octavo contiene buenas prácticas en la alimentación del ganado porcino, insistiendo en la necesidad de una ración bien balanceada, calidad de la proteína, vitaminas, etc. Encontramos datos valiosos de cómo corregir las deficiencias de los granos más usados en América Latina, especialmente maíz.

El Capítulo Noveno versa sobre la alimentación práctica de ovinos y caprinos, con los requerimientos nutritivos, engorde de corderos, influencia de la alimentación sobre la producción de corderos y de lana, etc.

En el Capítulo Décimo encontramos interesantes consideraciones sobre la alimentación del ganado de carne y de las limitaciones de esta industria frente a diversos ambientes. Para cada caso se hacen las recomendaciones respectivas.

La alimentación práctica de animales de trabajo, tan importantes en nuestro medio, es el tema del Capítulo Onceavo. Este solo tema sirve para dar una idea de las bondades prácticas de la obra.

La parte descriptiva se cierra con la presentación del Capítulo Doceavo, que trata de conceptos básicos sobre la alimentación de las aves de corral, con los requerimientos proteicos, vitamínicos y minerales y de cómo suplirlos.

En el Apéndice encontramos diversos cuadros sobre la composición de alimentos para el ganado, en relación con su contenido de materia seca, proteína digestible, elementos presentar dos columnas, una para el nombre científico y otra para el común, de los diversos forrajes, así como el origen de la obtención de los datos, nos parece excelente.

Cierra el libro, una lista con diversos forrajes, comunes en Latino América, y sus nombres en Castellano, Inglés y Portugués.

Para terminar, podemos concluir, que este libro reprenutritivos digestibles totales y minerales. La innovación de senta un valioso aporte latinoamericano que ayudará a comprender mejor nuestros propios problemas en la alimentación del ganado y a orientar nuestro trabajo futuro en este importante campo de la Ganadería.

Miguel Angel Rojas