

RESEARCH -- CLIMATIC CHARACTERISTICS OF OUR COUNTRY AND PRODUCTION PLANS

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Editors' Note:

Since the "Research" column was started in Hoc Tap, we have received many articles from our readers expressing their opinion on various questions being raised in connection with our country's revolutionary task. A number of these articles has been selected and printed, and drew much attention from our readers. In the articles which have appeared and will appear in this column, there are different opinions; we respect the authors' opinions and print their articles to offer them an opportunity to exchange their views. When necessary, we shall express our own views about such different opinions.

We welcome the articles you send to the "Research" column of Hoc Tap. We hope this column will be used for your painstaking researches and at the same time serve as a place for informal exchange of opinions on matters having to do with the revolutionary task of our people led by our party.

The editors' board of Hoc Tap

Climate has great effects on many aspects of production and life.

Climate is the permanent condition of the existence and development of the world of living beings, the factor that affects the driving force behind many natural processes, and the major source of energy that determines the formation and evolution of geographical features.

The history of man's evolution has been linked to climatic periods. Since time immemorial man has recognized the meaning of the climate in his

daily activities. Only recently, however, when scientific and technological progress brings about basic changes in the relationship between man and nature has the concept of the climatic resource been clarified. Man has expanded the exploitation of energy from rivers and is trying to get a direct use of solar energy, to actively alter crops, to harness the weather, to change the climate, etc. Climate is no longer an environmental factor but becomes truly a rich natural resource that man is perfectly capable of exploiting to enrich his life.

We have been boasting about our country's riches and beauty and do not fail to mention our climatic advantages. Thanks to favorable climatic conditions we can grow crops all year round. With the warmth and humidity of the climate of North Vietnam, crops grow quickly and yield abundantly. Our riches in terms of energies (water, wind, and solar energies) offer bright prospects for industrialization.

However, besides the rich climatic features there are many difficulties and obstacles. Storms, strong winds, drought, waterlogging, flood, and sudden climatic changes in general are the "natural calamities" which threaten our lives and destroy the fruits of our labor. Agricultural production is constantly unstable and activities in other productive sectors also are limited.

Is it true that we have so far wrongly evaluated our climatic advantages? Or is it because we have not known how to exploit the climatic resource, nor to organize production and our living conditions to conform to the climate, so that we must always fight and struggle against the calamities and threats that are not supposed to exist? Those were questions raised in recent exchanges of scientific views. Since the problem is of considerable importance, if we can solve it properly, we will be able to correctly determine the direction of growth for many economic sectors, mostly agriculture.

For the time being, our revolution requires that we make big leaps forward, overcome the old concepts, and find new factors to promote fast production development; any incorrect understanding of natural characteristics and potential will very likely bring about detrimental consequences later.

About the View on Climatic Evaluation

We used to accept the climate of North Vietnam as a kind of warm and humid tropical climate affected by seasonal winds. Recently a number of researchers insisted on additional features of cold winter and some degree of similarity to the climate of high-latitude localities. There have been hot debates on the two "tropical" and "subtropical" views. Some people believing that the North Vietnamese climate still is basically tropical have said that we should pay attention to the possibilities of warmth and humidity. Others thinking that the opposite is true have advocated an appropriate exploitation formula of "combination of tropical and subtropical features."

It is obvious that the debated subject has a definite importance of

its own. For in many aspects of production and standard of living dependence on climate has become quite obvious. However, in the light of modern science and technology, many basic concepts about the zone characteristics of geographic surface features (or the division of the surface of the earth into zones on the basis of latitude) and climates no longer have a sound meaning.

We know that the theory about zones based on surface features has originated from the belief that solar radiation is the source of energy behind all of the processes taking place in the crust, water, and air of the earth. Solar radiation has determined climatic, soil, hydrological, and vegetation-relationship characteristics. The speed and form of development of many natural processes actually could not be separated from the "initial" source of energy, i.e. the solar energy. That was the basis for many scientists (W. Koppen, 1922; Grigoriev, A., 1960) to establish the distribution of natural zones on the basis of solar energy distribution norms. However, in practical cases, the matter became more complicated because of the interference of a planetary factor -- atmospheric circulation, or simply wind currents. Consequently there appeared similarities of surface features, not along latitudes but longitudes. In the case of our country's situation, the alternating action of seasonal winds blowing in opposite -- southwesterly and northeasterly -- directions has caused considerable "disturbances" in the general tropical features. As a result, complicated surface features of both tropical and subtropical character have appeared, which in many practical ways could not be assimilated to the zone characteristics.

On the other hand, the achievements of modern science and technology have allowed man to overcome to a certain extent the limits set by nature. Many climatic boundaries have been destroyed (for instance, the new achievements in molecular biology have greatly extended the latitude limits for crops and animals which were raised only under the definite conditions of geographic surface features). Man still has great abilities to make changes in nature and climate by, for instance, building reservoirs to alter the water system, limiting the damaging effects of natural calamities, etc.

A correct view must originate from analyses of characteristics of the climate and of the conditions, formation, and development of the processes having to do with life, as well as characteristics of the natural resources to be exploited. In other words, any economic development scheme must be based on a correct evaluation of the advantages and disadvantages of nature, for the purpose of taking the former into consideration and limiting the latter and in such a way as to reach a definitely superior formula, instead of a superficial guess or recognition of the situation.

In regard to climatic advantages and disadvantages, there also are many different views on evaluation.

First we must affirm that the meaning of climatic advantages and disadvantages is only relative. There is no climate which is totally favorable, and conversely speaking, nothing is totally unfavorable either. It may be favorable in a certain aspect and unfavorable in another aspect, or favorable

in one point and unfavorable in another. For instance, too much sunshine is good for making salt but bad for raising crops and animals. Therefore, the key to the problem is how to rationally exploit the existing characteristics of nature. But, naturally, this does not mean that all of man's activities must always be "bent" to climatic laws. The matter has two aspects. On the one hand, man must take full advantage of the favorable conditions of nature to save his own energy. On the other, he must contribute to bringing about changes in nature and bringing nature closer to the needs of life.

We feel that we should mention here another aspect in connection with the nature of climate. Do not conceive climate as something that remains unchanged, an "important factor of space" apart from time. To conceive climate as a weather "pattern" and to evaluate it through mean weather characteristics (for instance, to evaluate the heat system of a place in accordance with "mean" temperature) obviously is to do something unrealistic. Actually climate is a "combination of weather conditions," an active weather system consisting of numerous forms of events and changes regulated by the laws of nature. It takes place not in the same way year after year, but the fact that it is regulated by nature's laws is evident only after a long process. Consequently, the fact that climatic events are irregular and change year after year is only natural, and the lack of stability in the volume of agricultural production, for instance, is also natural as long as this productive sector still depends on the climate.

But on the other hand, we can calculate by means of operations research so that the total volume of production in a long period of time, in spite of abundant harvest in one year and poor harvest in another year, would remain the highest. This concept has, in principle, an important significance for the effort to solve many practical problems having to do with crops, crop structure, etc., which we shall discuss later.

Another matter is a realistic view of climatic characteristics.

So far we have not conceived in a clear-cut way climate as a resource. If before building a house we survey the location of its foundation and before planning the construction of a factory we evaluate the sources of raw materials, energy, etc., it sounds like we are silly if in the course of drafting an economic plan we fail to consider the possibilities of nature contributing to the implementation of such a plan. The role of climate used to be underestimated, if not overlooked, in many cases when climate itself would be the fundamental condition. Just because we failed to understand the basic facts we have been unable to explain why potato (a temperate-zone plant) has been successfully introduced into our country while dairy cattle has always encountered many climatic difficulties. We have also failed to conclusively explain which of the perennial plants, the "tropical" or "subtropical" ones, would suit our climate better.

The fact to be stressed here is that climate as a resource is both rich in events and very complicated. From the standpoint of agriculture, for instance, if we say that the principal characteristic of the climatic

resource lies in the potentials of warmth and humidity (as we normally think, our statement is, in many cases, obviously inappropriate. Generally speaking, warmth and humidity as energy are the driving force behind the growth of crops, but this does not mean that transferring a crop from the conditions of limited warmth and humidity (from subtropical conditions, for instance) to richer conditions (tropical) would greatly boost its productivity. In fact, the tropical conditions are helpful only to a certain degree. And in addition to the role of the warmth-humidity factor, there are the effects of other factors like light cycle, radiation composition, seasonal structure, combination of weather conditions, etc.

The concept about climate as a resource for agriculture, therefore, belongs to a separate category, in which the role of the three following laws prevails:

- The law of limitation, that is the limiting conditions beyond which crops or animals cannot grow any more.

- The law of coordination, or the close relationship between one factor and another, in space and in time.

- The law of reciprocity, that is the action of one condition on another, of a part on a whole, etc.

The above example of the way to evaluate the climatic resource in agriculture can also be extended to many other categories.

In short, the evaluation of climate to serve a particular purpose requires a keen analysis of all of the aspects having to do with the nature of climate and on the basis of a dialectical and objective view. The understanding of the active laws of the climate will allow us to exploit in the most rational way the existing advantages, to limit to a minimum the disadvantages, and to overcome the contradictions in connection with nature.

Our Country's Climatic Characteristics, Advantages, and Difficulties

To have a basis for our observation, let us compare the climate of our country with that of tropical or subtropical areas.

With the special location of our country, in the southernmost part of "monsoon Asia," the conditions which make up the climate have become quite complicated.

The tropical or subtropical climate in general is mainly influenced by the solar radiation system. In the tropics where the sun passes twice a year across the zenith (at about summer solstice), the hot sunny weather lasts almost all year, with the seasons being very similar to one another in terms of weather conditions and the length of day and night. The subtropics (according to normal understanding, the region located at high latitudes and bounded by chi tuyen lines) have seasons of clearly different climates due to the

fact that the sun is very low in the winter half of the year and that the day is considerably shortened then as compared with the summer half.

But our country has peculiarities of its own. On the one hand, in terms of latitude, it is located totally inside the tropic lines and affected by the tropical solar system. On the other, the action of seasonal winds has created quite obvious disturbances in many aspects having to do with the nature of climate.

The winter monsoon (or the northeasterly seasonal wind), which originates from the high latitudes near the polar zone and carries with it cold and dry air, has been the reason for the cold and damp winter that prevails quite obviously over the northern part of our country. This is an "unusual" case for the tropical conditions.

However, as the monsoon activities are only temporal, and whenever the cold seasonal wind decreases in strength, the situation returns to normal like in other areas of the same latitude. As a result, a form of "tropical winter," very interesting and with decreasing intensity from the south to the north, has appeared. At the same time, also because of the effects of monsoon activities, the weather has been changing in an unusual manner, both in space and time, and in winter alone there are at least 3-4 climatic patterns within less than 15 degrees of latitude of our territory.

In summer, the role of monsoon is no less interesting. The summer monsoon (also called the southwesterly seasonal wind) blows quite strongly and covers the whole of Southeast Asia. But with the conditions of terrains in different localities, the climatic effects of monsoon are not totally constant. We can cite the example of the dry hot season with little rain in Central Vietnam, which is the opposite of the humid summer, with plenty of rains, in the North.

Therefore, if we compare a number of basic characteristics of our country's climate with the tropical or subtropical climatic criteria, we can find many aspects that deserve our attention (see table on next page).

In South Vietnam the climate is more consistent with the general tropical situation. But as far as the North is concerned, in regard to the year-round warmth-humidity system, the discrepancy seems negligible as compared to the tropical climate; in regard to the cold weather of winter, it is closer to the subtropical climate. Consequently, in a general sense, the climate of North Vietnam is not identical to that of any other part of the world, which creates a special situation that many researchers call "semitropical" climate. But this classification is still vague. To be more accurate, perhaps we must call it a hot and humid climate, with cold winters.

What do the initial results of comparison offer us?

First from the ecological standpoint we cannot identify the climate of the North with that of the southern part of our country or with areas of the

Table of comparison of climatic features

Climatic features	North Vietnam	South Vietnam	Cuba (Trop.)	East India (Trop.)	Algeria (Sub-trop.)	Georgia (Sub-trop.)
Radiation balance (Kcal./cm ² yr.)	80	95	100	100	60	60
Precipitable water content index(1)	1.1	1.0	1.2	1.0	1.8	0.9
Low temperature extreme	3°	14°	12°	10°	-8°	-10°
Annual heat accumulation	9000°	9500°	9500°	9500°	7000°	7000°
Heat accumulation in winter half of year	4000°	4500°	4500°	4500°	3000°	2500°
Annual rainfall	1500 mm	1500 mm	1300 mm	1600 mm	600 mm	1500 mm
Number of months with temperature below 20°	2-4	0	0	0	3-5	4-6

(1) Precipitable water content index = ratio of evaporability to rainfall.
The higher this index, the drier the climate.

same latitude. On the other hand, such an interesting climatic situation will probably offer definite advantages which we must exploit. But the main thing to do is to correctly evaluate the advantages that can be exploited and to know the difficulties we must avoid and try to overcome.

Then what are the basic climatic characteristics of North Vietnam?

1. The most outstanding characteristic is the fact that there is a cold winter against the general background of a warm and humid climate. This is the result of a very clear seasonal division of the climate, due to the effects of monsoon circulation.

As we pointed out earlier, the monsoon with different sources and contrasting characteristics has been the major factor affecting the weather in two periods of the year. The "winter" monsoon season begins in October-November and ends in March-April; the "summer" monsoon season fills in the rest, from April-May to September-October. Therefore, we can say that in the North there are only two major climatic seasons, with winter being the most interesting one.

The interesting aspect of the cold winter first is seen in the fact that the drop of temperature is due to the monsoon effects but not the sun. This explains why right in the middle of winter we often have warm sunny days, every time the cold monsoon weakens. And the cold weather varies considerably within North Vietnam, between the areas that are directly affected by the monsoon and the areas hidden from it.

On the other hand, due to the effects of wind systems having different characteristics, we have other very interesting winter weather forms. There are dry cold days, damp and humid days, periods of cold or warm days of drizzle, and even "summer-like" warm sunny days or days of long heavy rains.

In addition, although the winter temperature in North Vietnam can be very low, winter generally does not last more than 3 months. The coldest months are January and February, but in March the number of warm sunny days is pretty much on the increase. In transitional periods (March-April and October-November), except for some unusual years, warm weather is more frequent.

Percentage of warm and cold weather in the months (percent)

Type of weather	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Cold	45	42	18	4	-	-	-	-	-	-	8	24
Warm	42	38	68	88	100	100	100	100	100	92	52	45

This situation leads to considerable warmth-humidity potential in most of the winter half of the year (which we usually call the winter-spring crop season), which is as much as over 80 percent as compared to the summer half (the summer-autumn crop season). This potential of the winter climate has not yet been correctly evaluated and fully exploited.

With such characteristics, except for the low temperature, there are almost no common features between the winter climate of North Vietnam and the subtropical winter (the same applies to the summer). It is something we must pay attention to as we apply climatic conditions to production.

2. The second important characteristic is the quite obvious changing character of the climate, which affects many actual activities. This characteristic is also closely related to monsoon. The latter, with the role of a "planetary factor" (to be distinguished from cosmic factor, which is solar radiation), is far from stable in terms of strength, characteristics, and scope. It may be strong or weak, widespread or limited in scope, and early or late at certain times and in certain years. The characteristics of monsoon are reflected in the climate. As a result, climatic seasons in the North of our country change constantly not only in their features but also in their length. Between one year and another, they may begin or end 1-2 months sooner or later than each other. The cold season (according to normal acceptance, the period when temperature drops to below 20°), for instance, can arrive in November in a certain year or can be as late as the end of December in another year. The coldest month can switch among these 3 months -- December, January, and February. The same happens to the rainy season which does not necessarily coincide with summer and may start at the beginning or the end of summer. Rainfall also varies from one year to another.

The changing character is also evident in the weather structure of a

certain season. Winter can be very cold or mild, dry or humid. Temperature rises and falls within the range of 10-15°. In summertime rainfall distribution is uneven, with great differences between the months.

The great changes in climatic factors do limit the meaning of the average features. In regard to temperature, for instance, the coldest month can vary 4-8° from one year to another; as to rainfall, the figures may show differences of 2-5 times. Generally speaking, we find that the climate in only about 30 percent of the years is relatively consistent with the law of averages and that the rest shows "irregularities" of one kind or another. Therefore, the average values of a certain climatic feature (average monthly temperature, for instance) provide us with only a very simple understanding of its nature.

We must also add that the "irregular" manifestations of the weather, such as drought, waterlogging, warm weather, cold weather, storm, and flood, seem quite common under the conditions of North Vietnam. This is another aspect of the changing climatic pattern related to the monsoon activities. However, it is not true that in such climatic changes there are no definite laws.

3. The third characteristic to be noticed is the obviously extreme climatic distribution in space. Perhaps nowhere in the world within the boundaries of a not very large territory are the climatic varieties manifested in such an extreme way as in North Vietnam. This greatly varied climatic distribution is also more related to the monsoon than to the sun. Under conditions of an interesting combination of the effects of monsoon circulation and the local terrains have appeared many climatic manifestations of pretty strong local character. These local climatic forms are different from one another not only in their general characteristics but also in seasonal structure, ecological characteristics, etc.

In general, the diversified distribution usually shows a very obvious regional character, and in many cases this regional character clearly goes beyond the law of distribution by latitude or longitude. There are many reasons behind this distribution: the changing character of monsoon, the isolating effect of mountain ranges, terrain elevation or geographic location, etc.

We can distinguish within the boundaries of North Vietnam alone at least five climatic patterns:

- The climate of the area northeast of Bac Bo (the former Cao Bang-Lang Son-Bac Giang area) with winter being quite cold and summer being warm and relatively dry. In winter temperature may drop to 0° and there may be snow. In summer there are not very many rains and it is moderately warm. This is the area whose climate is in many aspects closest to the subtropical climate (for instance, the central of China).

- The climate of the Red River delta and Viet Bac (Tuyen Quang-Bac Thai-Ha Giang) with winter being less cold and warmer. The lowest winter

temperature is only 3-5° (in low areas); summer is warm and humid and has a lot of rains. The effects of the dry warm westerly wind are relatively minor.

- The climate of the Tay Bac Region with dry and cold winter and warm and humid summer. It is to be noticed that the drop of temperature in winter-time here is mainly due to terrain elevation but not the monsoon. In summer-time the effects of the dry warm westerly wind are pretty evident in the early months. We can say that the climate here resembles that of a tropical mountainous area, with the cold season being longer in the Meo highland areas.

- The climate of the area north of former Zone 4 (Thanh Hoa-Nghe An) resembling in many ways the climate of the Red River delta. However, the effects of the southwesterly wind are very obvious here, leading to a dry warm period in summer. Rains fall mostly toward the end of the season.

- Finally, the climate of the area extending from south of Ha Tinh to the south which can be considered a special form of tropical climate. There is virtually no cold winter, with the lowest temperature seldom dropping to 12°. But unlike the normal tropical climate, the rainy season does not coincide with the warm season but moves more toward late summer and early winter. The first half of summer becomes a dry and warm season, while the first half of winter is a humid and wet period, with a lot of rains.

Beside these regional climatic forms, there is the distribution by elevation which manifests itself in both the heat system and rainfall. Ordinarily, as we go about 100 meters higher, the temperature decreases by about one-half degree and the cold period extends by about 6-10 days. Rainfall varies greatly and depends on the mountain slopes being either exposed to or hidden from the wind (the slopes exposed to the wind get more rains, the slopes hidden from it get less).

Because of such a diversified climatic distribution we must carefully raise the question of zoning for production. In agricultural production, for instance, each area requires a different crop formula and crop structure of its own.

So on the basis of the characteristics analyzed above, how do we evaluate the advantages and difficulties of the North Vietnamese climate?

The basic advantage is the abundance of heat, humidity, light, and winds. This advantage determines the possibility of developing a rich and economically efficient agriculture, with favorable conditions for raising productivity and volume of production. The annual heat accumulation in the North is more than sufficient for raising 3-4 times the crops that prefer heat like rice, corn, and cotton. Rainfall of 1-1.5 million cubic meters per square kilometer per year (with up to 10 tons of useful fertilizers used in the same unit area) is a great resource for cultivation, animal husbandry, as well as for many industrial sectors.

At the present time we pay little attention to directly exploiting the potential climatic energies. The use of water power is not higher than 10 percent of our exploiting capacity. Radiation and wind as sources of energy are not being used much. The exploitation of such climatic resources is not a simple job, of course, and requires a coordination of many efforts, serious consideration, and a practical analysis of the matter as a whole.

The second advantage of the North Vietnamese climate is the abundance of features, both in seasonal events and in diversified distribution in space. It is not possible to find everywhere such a wide range of climatic changes suitable for many needs of production and standard of living as it is found in North Vietnam. A very large number of crop and animal species of tropical or subtropical origin can find compatible ecological conditions (at least in a certain area or season) in the climate of the North. This is a favorable basis for raising purebred and crossbred animals and applying the production experiences of foreign countries.

However, there must be serious consideration and calculation before we exploit such climatic advantages.

How do we evaluate the climatic difficulties in terms of actual production?

In reality, these difficulties have two aspects. On the one hand, they are due to the organization of production that is not suitable for the climate. This is the case of degeneration of a number of tropical or subtropical species imported into North Vietnam on an experimental basis. On the other hand, the difficulties are due to climatic changes. Late cold weather, early warm weather, waterlogging and flood, drought, irregular rains, etc. all are the reasons leading to an unstable situation of agricultural production. But in the construction of a house, if because of technical failures it is too warm inside, it lacks light, or it is poorly ventilated, what do we blame it on, the planning job, the construction, or the climate? It is obvious that a lot of difficulties we encounter are due to a lack of careful study, consideration, and appropriate measures to deal with the situation.

As to the changes, we must first of all recognize that they are an attribute of the climate. No climate is completely stable, and climatic laws are never as rigid as the arrangement of days and months in the calendar. The reason why climatic changes can create unfavorable results in production and standard of living is that we have not fully and correctly evaluated their laws.

In short, in production planning we must not overlook the climatic condition, but instead we must always start from a complete evaluation of all the advantages and difficulties that are involved in individual cases; this is the task of the agencies responsible for practical climatic studies.

Practical Meaning of the Subject

In recent years, due to a more correct understanding of the nature of climate, we obtained remarkable results in the development of new trends in production. For example, production in the winter crop season or planting of rice crops in the spring. Experimental hybridization also brought about encouraging results.

Besides agriculture, a number of other productive sectors also began to pay attention to the practical meaning of climate. The construction and communications and transportation sectors, on the basis of climatic laws, drafted more rational plans for use of manpower and reduction of waste. Construction projects were more and more improved to suit climatic conditions better.

The Meteorological Service, in this regard, made contributions to studying climatic laws and recommending ways of application and supply of climatic materials to various sectors. Weather forecasting became more and more accurate, thanks to better evaluation of the laws of climatic events and zone distribution.

However, in our effort to solve a number of other important problems in production, particularly in agriculture, we still had many things considered inappropriate and failed to determine the principles behind others just because our views had not been consolidated. To clarify the questions that are raised in individual cases, we must have careful analyses and exchanges of views about various aspects of such questions. We suggest hereunder a few big and most urgent points which must be solved early in order to facilitate the planning of economic development at both central and local levels.

1. About the structure of crop growing and animal husbandry. First let us discuss the rationality of this structure. Many factors -- economic, social, natural, etc. -- determine this rationality. Let us put aside for the time being other aspects and examine only the suitability of climate as a basic principle to assure economic effectiveness of agricultural production.

A rational structure of crop growing and animal husbandry must be aimed at exploiting to the highest degree the regular advantages of nature and the climate and avoiding as many difficulties as possible. It is obvious that, with the climatic conditions of North Vietnam, to exploit these advantages is to gain from the abundance of heat, humidity, light, water sources, and climatic events. As to difficulties, we mainly need to overcome the situation of an irregular and changing climate.

Consequently, a rational structure of crop growing and animal husbandry not only must rely on diversity in terms of species and breeds, but it must also allow us to take full advantage of the availability of heat and humidity by repeating crop rotation cycles. It will be easier to arrange short crop seasons, which allow us to avoid the effects of weather changes more easily, while still assuring sufficient energy storage. Speaking from

the viewpoint of statistical probability, it is always easier to assure climatic safety for, say, a 3-month crop than for a crop that must last 6 months. The use of short-term high-yield varieties is a good thing to do to limit losses caused by irregular climatic events.

About characteristics of species and breeds, we must fully recognize that although North Vietnam's climate covers the ecological limits of many tropical and subtropical crops and animals, we must consider the fact that such features as light, percentage of humidity, seasons, and the changing character of climate require definite conditions for raising purebreds, and therefore we must pay utmost attention to selecting, crossing, and creating new varieties and breeds.

A remarkable thing is that, due to the unique character of our climate, we can always gain from the advantage of commercial crossbreeding to help boost volumes of production in crop growing and animal husbandry. On the other hand, we should not do away with "traditional" varieties, which have proved their "resistance" to climate; we must instead suggest reforms as a means to gain from their advantages.

In importing varieties and breeds from foreign countries, we face the question of applying artificial climatic protection and control, a question which has been drawing great attention in other countries, mostly tropical countries. In our country, to use artificial means to fight the heat and humidity is both necessary and useful in case we import a number of subtropical or temperate-zone species and breeds. Besides, there must be active and more effective measures to regulate the volume of water and to store water in order to overcome irregular climatic changes.

2. About agricultural techniques. The problem having the greatest importance is that of crop schedule. How do we determine crop schedule to make it rational?

To achieve crop schedule rationalization -- i.e. to gain to a maximum extent from favorable conditions -- we must rely on probable calculations of climatic events to choose the best formula for spreading our crops evenly so as to have no crop losses under any circumstances and to obtain the highest volume of production in a period of several years. This calculating must be based on appropriate norms about agricultural weather conditions. Although this is not a simple matter, it can be carried out through coordination of activities of agricultural, climate, and operations research specialists. A fact that deserves our attention is that due to different climatic conditions in different localities, we must have special crop schedule formulas for different agricultural climatic areas.

In addition to the crop schedule question, other technical aspects must also be reconsidered from the viewpoint of climate. For instance in regard to fertilizing or insect-fighting techniques, climate is far from meaningless. As chemical decomposition processes take place very quickly due to warm and humid climatic conditions, fertilizers decompose quickly, insecticides

quickly lose their effectiveness, hence larger amounts are required, and the soil quickly degenerates and becomes contaminated. But the warm humid climate is also favorable for many biological processes. We have therefore a greater possibility to use fertilizer with microorganisms and to widely apply biological or microbiological measures to destroy harmful insects, thus quickly overcoming the current "chemical inflation" situation in agriculture.

Let us on this occasion mention a few new production techniques which may be suitable for our country's climate. They are the hydroponic (growing plants in solutions), biochemical, or microbiological formulas. It is very possible that under the conditions of abundance of heat, humidity, and light in North Vietnam these new techniques will greatly contribute to raising the volume of our agricultural production and solving difficulties created by scarcity of land in many areas.

3. About agricultural zoning. Because of climatic distribution features, as we carry out agricultural zoning, we must attach great importance to climatic natural bases. The question of agricultural zoning based on climate and the principles to be applied have to do with many matters and deserve a full discussion on another occasion. Let me mention here just a few general points.

There are many reasons having to do with climatic seasonal conditions and characteristics of the heat-humidity system to support the point of discussion that the purely tropical plants (for instance, pepper, coconut, and rubber) should not be planted above the 18° parallel (Ha Tinh) because the more we go north, the more the economic values of tropical plants decrease and the more measures to protect them from climatic conditions are required. For the subtropical species, the most appropriate region is the northeast and a number of mountainous areas. The climate of the northwest with dry and cold winters is definitely suitable for animal husbandry and a number of subtropical varieties having poor resistance to humidity.

As to the bases for agricultural zoning based on climate, seasonal characteristics are the most significant one. The climatic seasonal characteristics (length and degree of cold weather in winter, weather structure, scope of climatic events, etc.) serve as bases for determination of crop schedule, species and breeds, technical measures, and even economic effectiveness of animal husbandry and crop growing formulas.

The second norm is agricultural climatic condition. However, do not understand this condition of agricultural climate too simply through such features as heat accumulation, temperature limit, rainfall, etc. These features are significant only to a certain degree, but what is more important is the capabilities to grow crops and the various conditions necessary for the phases of growth and material accumulation. For instance, during the time of budding and during the growth of rice ears the decisive factor is light (intensity, cycle, etc.). Therefore, the evaluation of agricultural climatic condition should be based on the three above-mentioned laws regulating climatic events and on the choice of the most significant climatic conditions.

4. About other matters. In other productive activities, climatic suitability is also a principle to be understood and to apply flexibly.

Climate can affect working capacity, outdoor or indoor working conditions, quality of raw materials and products, etc. Factory planning, drafting of production plans, and manpower distribution must be based on a correct evaluation of climatic characteristics. To exploit the heat- and energy-producing capacities of climate for direct application to industrial production or to better living conditions is also a matter that deserves our attention. For instance, under the climatic conditions of North Vietnam, we can greatly develop such productive sectors as industrial animal husbandry and microbiological industry, and use technical means like equipment to draw solar heat, to generate electricity with wind power (taking advantage of wind power to produce electricity on a small scale), etc.

These matters require further exchanges of views among specialists in different fields of production.

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