developed in certain parts of the country. Attention may also be drawn to the fact that side by side with the development of new industries, the produce from land should also be increased. We may even venture to suggest that the new industries are more likely to succeed if they involve the utilisation of surplus agricultural produce—wherein there is yet no danger of foreign competition—and cheap labour, which is plentifully available, rather than if they require the importance of either raw materials or expensive machinery from abroad.

The Future of the Sugar Industry.

IT is rather unfortunate that the Conference held recently* at Simla did not lead to any definition of policy that would materially help the cause of the sugar industry in the country. There was ample scope for the free exchange of views, but the delegates could not arrive at any unanimous decision regarding any one of the items on the agenda. The Central Government, quite wisely, sought the necessary guidance from the experience of the Provincial representatives, but the latter were unfortunately so circumscribed that they could not view the problem as an all-India question. The Conference thus ended the delegates parting with the satisfaction that they had an opportunity to understand each other's views and plans.

The Conference was convened by the Government of India to consider whether (1) the present rate of development of the sugar industry is satisfactory, (2) the protection has unduly benefited the manufacturers at the expense of the consumers, (3) the benefits of protection are being adequately distributed between the cane growers and the sugar manufacturers, (4) the interests of the industry will be best served by zoning of areas, licensing factories, fixation of cane prices or other means, and (5) any legislation is needed to regulate the Indian sugar industry and, if so, to what extent the necessary action should be taken by the Central or the Provincial Governments.

The proceedings of the Conference may be summed up as follows:—The chairman (Mian Sir Fazl-i-Hussain) welcomed the delegates in a short and felicitous speech and placed the problems at issue before the meeting. The discussion on the present position of the sugar industry elicited diverse opinions, the provinces which had already made some headway viewing further expansion with disfavour while the others, less fortunate, pleaded for the erection of more factories. A resolution expressing satisfaction with the present progress and viewing further production of white sugar as being detrimental to the interests of raw sugar (*gur*) manufacture was passed by a majority, but was rescinded at a later stage. Considerable amount of time was devoted to the discussion as to whether any legislation was needed to regulate the nature of the relation between the growers and the manufacturers. Some of the provinces were for the zoning of the areas and regulation of the cane prices while the others were either opposed to such an arrangement or had no experience of the problem. A small committee was appointed to go into the question, but their findings were ignored as a 'private report', so that although the United Provinces is already faced with the difficult problem of having to adjust the relation between over thirty factories and the growers, no useful line of action could be agreed upon. Some time was devoted to a discussion of the problem of utilisation of molasses, but a resolution sponsored by twenty members requesting that (*a*) sugar manufacturers be permitted to produce power alcohol from waste molasses and sell it for use in India and abroad, and (*b*) petrol companies in India be made to sell liquid fuel containing 30 per cent alcohol was disallowed by the chairman. The Conference thus terminated having reached no decision regarding any of the points at issue.

It is indeed regrettable that the Conference could not view the problems in their proper perspective and arrive at decisions which would not only ease the present situation but also avert possible difficulties which would arise in the future when the protective tariff is withdrawn. Any one interested in the stabilisation of a prosperous sugar industry in the country should take the following facts into consideration:—(1) All provinces of the country are not equally well adapted for growing sugarcane in an intensive manner that would facilitate a large-scale production of the sugar at rates that would defy competition from other parts of the world. (2) In certain parts of the country, particularly in regions which are far away from the coast and situated at considerable distances from the

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* 10th to 12th July 1933.

more intense sugarcane areas, it may still be possible to produce sugar at competitive rates owing to the heavy cost of transit from one part of the country to the other. (3) In all civilised countries the consumption of sugar per head of population has greatly increased during the past few decades. It is not improbable, therefore, that with a more liberal supply of sugar and with increasing general prosperity, the Indian consumption may become doubled or even trebled during the next half century. (4) Although raw sugar has certain good qualities and appeals to a particular type of palate, yet even in orthodox circles it is now being steadily displaced by the cleaner and better-keeping white sugar. The sentiment against the use of bone charcoal is steadily weakening and with the introduction of new and more active types of charcoals of vegetable origin even the little objection which now exists against white sugar will soon disappear. (5) The process of refining raw sugar is at present somewhat expensive and wasteful, but with improvement in the technique it should be possible to convert it into a paying industry. In other words, even in localities where cane growing is somewhat scattered it may soon be possible to collect all the raw sugar and convert it into the white, crystalline product. (6) The problem of utilisation of molasses is already assuming serious proportions. Unless some new use such as conversion into crystalline sugar or edible sugar syrups is developed, manufacture of power alcohol would be the only satisfactory method of utilising the large quantities that would be turned out every year by the numerous sugar factories in the country.

Reviewing the present position in the light of the above facts, it would be seen that the cultivation of sugarcane, as also the manufacture of white sugar, will always be more intense and more paying in certain parts of the country (*e.g.*, a large stretch of the Indo-Gangetic plain) than in others. There are also fairly big patches in other parts of the country where sugar can always be produced on a competitive basis. Some of these areas are situated far inland (*e.g.*, Mysore), so that with the additional protection imposed by the high cost of transit they could always defy foreign or other internal competition. It should, at the same time, be admitted that there are several other tracts in the country where cane is now being grown and factories are either already operating or on the point of doing so, where the industry will either not pay or will bring in a useful return only so long as the present protective tariff prevails. It would follow, therefore, that the Central and the Provincial Governments should actively co-operate in encouraging areas where the conditions will always be favourable for profitable manufacture of sugar and discourage others where the investors are eventually likely to fail. It is no doubt true that it will be difficult to arrive at correct estimates of the cost of production of sugar in different parts of the country and the possible extent to which they could eventually compete on the basis of free trade, but judging from the average yield of cane and the general factory conditions, it should be possible for a competent committee of experts to arrive at useful working estimates for different localities which would serve for the guidance of the Government or the information of the public. The success of several North Indian factories has inspired a certain amount of confidence in the sugar industry and large amount of capital is flowing unreservedly even into areas where the industry will not pay. The public should, therefore, be given the necessary authentic information so that they would be properly guided in their investments on new ventures.

The future of white sugar in relation to *gur* will largely be determined by public taste. There is already evidence of increasing favour for the white sugar and if the conditions prevailing in certain Western countries like Great Britain could be taken as the standard, one may reasonably expect that white sugar will soon almost entirely displace the raw product.

With regard to the total consumption of sugar, the experience of different parts of the world would point to its being definitely on the increase. India could be no exception to the rapidly developing "sweet tooth" so that this tendency combined with the possible preference for the white sugar will hold out a highly hopeful future for the sugar industry.

It is no doubt true that a pampered and well-protected industry may (*sic*) take its own terms both to the growers and to the consumers. With a view to ensuring fair deal to the latter, the Central and the Provincial Governments can maintain competent standing committees that can determine (*a*) the minimum price to be paid to cane in each locality, and (*b*) the maximum

price that should be paid by the consumer in any part of the country. At the same time, with a view to reducing the risk of excessive internal competition, the Central Government may legislate offering a useful bounty on sugar exported abroad. In this manner not only will there be fair deal all round but by the adoption of a watchful policy the Government will also be stabilising an industry which the protective tariff has now helped to create. At their end the manufacturers should also organise their efforts both for increasing the popularity of sugar as an article of food and for establishing a useful export trade.

It has already been mentioned that the process of sugar refining as at present practised, is not paying except for the manufacturer of sugar of the highest type of purity for which there is only a limited demand. Since the establishment of refineries will be the only workable means of manufacturing white sugar in certain parts of the country where cane is scattered, it may therefore be necessary to initiate researches with a view to simplifying the process of refining so that raw sugar can be converted into white product at moderate cost. The Central Government should encourage the necessary scientific investigations by subsidising them and offering attractive prizes for new and workable methods.

The problem of utilisation of molasses is engaging the attention of scientists all over the world, but so far only the manufacture of power alcohol has proved to be the most satisfactory method of converting that by-product into an article of commerce. The fermentation of molasses to alcohol is now a fairly well standardised process and yields of about 90 per cent. of the theoretical amount of alcohol may be reasonably expected from well-managed distilleries. Two essential points for success of the manufacture are that the process should be continuous and that the energy spent on the distillation of alcohol should be reduced to a minimum. There are now a few good types of fermenting and distilling plants on the market and with proper technical control it should be possible to make the process a success. Alcohol of nearly absolute purity is miscible with petrol in all proportions and, as suggested by several of the representatives at the recent Conference, all internal combustion engines designed to run on pure petrol can work, with at least the same efficiency, on liquid fuel containing 30 per cent. of alcohol and 70 of petrol. In addition to the above, alcohol is the basic material for a number of chemical manufactures and pharmaceutical preparations, so that, with an abundant supply of cheap alcohol, there will be a great stimulus to various other industries in the country.

It should be admitted, however, that the excise control of the manufacture of alcohol by private factories is highly difficult. It may, therefore, be suggested that the manufacture of alcohol from molasses be established as a separate industry managed or adequately supervised by the State. The distilling company can then buy the molasses at scheduled rates from the sugar factories in the neighbourhood and manufacture the alcohol. The size of the fermenting and the distilling plants would depend on the amount of molasses available in the district. The alcohol thus produced can, at any rate for the present, be distributed directly under State supervision. Admixture with petrol may be carried out at the big provincial stores and the new liquid fuel supplied as such, to the retail dealers who, in turn, will sell it to the consumers. In this manner, both the misuse of alcohol as such and the possible further adulteration of petrol with alcohol can be avoided.

It is not improbable that there may be a certain amount of misgiving in the minds of the petrol manufacturers that the consumption of their product will be reduced to the extent to which alcohol is added. But such need not necessarily be the case. The abundant supply of cheap fuel will in fact stimulate increased consumption of the new petrol by automobiles and as also various industries. Moreover, petroleum has several valuable properties which could not be easily displaced by alcohol so that there is no need to apprehend the future of the oil mining industry.

Other possible uses of molasses would relate to either its conversion to clean sugar syrup, manufacture of animal feeds or utilisation as manure for sugarcane and other crops as is now being done in other countries. It is no doubt true that molasses contains the major part of the minerals taken up by the cane during its life, but the sugar present along with it will be largely wasted in the soil. It is possible that under highly favourable conditions the molasses will help the soil to fix the nitrogen of the atmosphere, but, more often than not,

injudicious application of molasses either as such or with diluted water to the soil would lead to profuse growth of fungi, which would not only lead to soil sickness but also perhaps attack the cane growing thereon.

In the foregoing columns we have only outlined some of the more important problems that now face the sugar industry in the country. Factories are springing up everywhere at a rapid rate and it is not unlikely that, before long, some of the problems may become highly acute. It is suggested, therefore, that while conditions are still favourable the Government should take the initiative in the matter and appoint a competent committee to go into the above and related problems and advise them with regard to the best means of dealing with them. It is not too much to hope that by the adoption of such a wise and far-sighted policy, India will not only have stable sugar industry of her own, but will also, before long, be one of the foremost sugar exporting countries of the World.

Research Notes.

Peach Yellows and Sandal Spike.

IN a recent paper (*Contrib. Boyce Thompson Ins.*, **5**, 19, 1933) Dr. L. O. Kunkel shows that peach yellows is transmitted by the leafhopper *Macropsis trimaculata*, and not by several other suctorial insects with which transmission experiments were tried. The obvious inference is that *M. trimaculata* is the specific vector of peach yellows.

This result is of considerable interest as the vector of this virus disease, like that of sandal spike, has eluded prolonged investigation. Moreover, with sandal spike, peach yellows was at one time regarded as being due to unbalanced sap circulation, a theory which continued in certain quarters because the vectors of these diseases were unknown. The case of peach yellows has also been cited as an argument against the hypothesis (Dover, *Ind. For. Rec.*, **17**, 1, 1932) that sandal spike is transmitted by a specific suctorial vector belonging to the Jassidæ, in which group the vectors of other yellows diseases, such as Aster yellows, are included. It was said that "The fact that other diseases are carried by sap-sucking insects does not form a sound argument for extending the analogy to spike-disease. There are several diseases of the virus group, in fact, which have not been transmitted by sucking insects. Peach yellows and peach rosette are typical instances in point." According to Quanjer (*Phytopathology*, **21**, 577, 1931), however, the yellows diseases are characterized by the fact that they are transmitted only by grafting and by specific suctorial vectors (never by mechanical sap inoculation), peach yellows and sandal spike being regarded as exceptions to the rule, as they had been transmitted by grafting but not by insects. Dr. Kunkel's work, therefore, not only definitely identifies peach yellows with the other yellows diseases, but provides indirect support for the contention that a specific suctorial vector is also responsible for the transmission of sandal spike, the remaining exception in the yellows group of viroses.

The success which has attended Dr. Kunkel's studies on peach yellows, and his work on other yellows diseases, should provide much encouragement and inspiration for those engaged on the problem of sandal spike. Patience and a critical attack have conquered the most elusive problems offered by virus diseases, and there is every reason to suppose that the sandal spike problem is susceptible to the same approach. In fact the information already available suggests that it will not be long before the cause of sandal spike is positively determined.

CEDRIC DOVER.

The Origin of Granite Magmas.

THE recent paper by P. Eskola (*Miner. und Petrogr. Mitteil*, **12**, Nos. 5 and 6, 1932) forms an important contribution towards the solution of the controversial problem of the origin of granitic magmas. From his intimate knowledge of pre-Cambrian massifs, he discusses the possibility of reconciling the two apparently opposed facts—"the downward increase in the amount of granite in the upper parts of the earth's crust and the downward increase of basicity in the globe as a whole." His conclusions may be briefly summarised as follows: "(1) The sial crust (*a*) originated mainly by crystallization-differentiation allied with partial