

paddy, which is a survival of the Vedic ceremony of Agrayana.

The ceremony next in importance is the worship of the agricultural implements on the Vijayadasami day, during the Dasara of South India. This corresponds to the Viswakarma day in Bengal. There are also special forms of worship before harvest. At the time of reaping the sickle God is worshipped. A handful of the crop is then cut and placed in the central part of the field, and near it five stones are placed. The sickles of all the reapers are collected and deposited in a row in front of these stones. They are all worshipped with the breaking of cocoanuts and the burning of incense. The ears of the corn are safely preserved at home and the grain obtained from them is mixed with the seed grain during the ensuing year. Before the grain is removed in carts or head-loads from the fields to the threshing floor, a coconut is broken and incense burned. When the threshing is done and the grain heaped together a similar offering is made to the *pillari*. It is also the universal custom that, before measuring, a small portion of grain is set apart

for distribution to the poor villagers who may chance to go there.

There is also a similar ceremony at the end of Magh or Makaram, when the crops have been harvested, the agricultural operations have come to an end, and Mother Earth is supposed to take some rest or remain in a state of incubation. At the beginning of this period, the agricultural castes of Malabar observe a festival in honour of Mother Earth which is like the Roman Februria supposed to take place at the same time. It is believed that on the last day of the festival all agricultural leases connected with the land are supposed to expire. In some of the villages of the Walluvanad Taluk of Malabar, special festivals are celebrated with straw models taken out in procession to the Bhagawati Temples.

After the harvest the farmers and others in the villages find their granaries full. It is during this part of the year that all the village festivals are celebrated in honour of the Gods as thanks offerings with prayers for similar harvests in the following year.

### Research in Irrigation.

THE Fourth Annual Meeting of the Research Committee of the Central Board of Irrigation was held in Simla on the 19th and 20th July, 1934. Officers from the following Provinces were present:—Bombay, Sind, United Provinces, Punjab, Bengal, Madras and North-West Frontier. The Meeting of these Officers is of considerable value as it leads to the co-ordination of research work, the exchange of views with a consequent development of new lines of research, and affords an opportunity for the discussion of the particular problems with which each Officer has to deal.

The Agenda for the Meeting included: (i) a discussion of the research work carried out during the year in each Province, (ii) reports on the progress made on a number of investigations, and (iii) the consideration of investigations started during the previous year. As irrigation is of such great importance to the whole of India, a brief summary of the Proceedings may be of interest.

The reports on the work done showed the importance now attached to model experiments. In Bombay, models were used to determine methods for the exclusion of silt from canals and to determine the coefficient of discharge of the Sukkur Barrage Gates. The models studied in Sind had reference to the number and position of the vanes to give a suitable distribution of velocities over the normal section of the channel below flumed falls and regulators, to the coefficient of discharge of radial gates and to the determination of the modifications necessary to eliminate heavy action downstream of a syphon. The report of the Irrigation Research Institute, Lahore, showed that two types of experiments on models were being carried out. The first type dealt with the protection of the downstream glacis of weirs. A system of protection depending upon the throwing of the high velocity water to the surface has been evolved. This form of protection reduces scour to a minimum, and hence will reduce considerably the cost of maintenance of head-

works. The second type of work on models deals with the flow of water under works and the pressures involved. Some reference has already been made to this subject in this Journal (Vol. II, April 1934, No. 10). The recent developments are connected with the determination of the effect of an upstream sheet pile on the pressures on the work. The Central Board of Irrigation has now agreed that no major work should be constructed without first being studied in model form.

An important discussion took place on the seepage losses from canals, distributaries and water-courses. Observations made in the United Provinces showed that the major losses occurred in the water-courses and distributaries. The complementary subject of linings was also discussed. The conclusion reached was that lining was not a feasible method of dealing with the losses on large channels which had already been constructed, but that the lining of distributaries and minors was a practical proposition. As the greatest losses occur on these latter types of channels it was agreed that any scheme for lining would be best commenced from the minors.

Considerable attention has been devoted by the Research Officer, Sind, to the study of waterlogging and drainage. The Research Division has a most elaborate system for studying the variation of the level of the sub-soil water-table. The results reveal a rise of water-table in certain areas and indicate that measures will have to be taken at no distant date to control the rise. Before any irrigation scheme is contemplated in future, the example of Sind in this respect should be followed.

In the Punjab the effect of rainfall and irrigation on the water-table has been studied in the areas commanded by the Upper Chenab Canal and Upper Jhelum Canal. It has been shown that there is a high correlation between the movement of the water-table in these areas and the amount of monsoon rainfall. As a result the Government



has decided to develop the drainage in the northern areas of the Punjab during a period of five years.

In the Punjab the progress on the study of alkaline soils is reported. These investigations have been conducted in connection with three allied problems:—(1) The prevention of land deterioration under irrigation. (2) The study of land reclamation. (3) The quality of irrigation of water.

A factor known as "Degree of Alkalisiation" of the soil has been a subject of study during the year. It has been shown that crop yield in the plains of the Punjab decreases as the "Degree of Alkalisiation" increases. It has further been shown that a relatively small proportion of calcium in solution can prevent alkalisiation of the soil associated with the presence of the sodium salt. The equilibrium conditions for a system "sodium salt—calcium salt—calcium sodium clay" have been studied and the results are now being applied experimentally in the field. These results also have an important application in determining the quality of irrigation water that can be safely used without soil deterioration taking place. It has been shown that water containing above 60 parts per 100,000 of sodium salts in solution results in base exchange and hence the soil deterioration. The presence of a small amount of calcium salt in such a water can prevent this reaction. The quality of irrigation water is a subject of special importance in the Punjab at the present time as proposals have been made for a development of irrigation by means of tube-wells following on the electrification of the Province.

Considerable discussion took place on the silt and flow theories which have been put forward by Mr. Lacey. While some of his formulae were accepted others that had been tested both in the Punjab and in Sind showed that they did not, in their present form, apply to the channels in these Provinces. It was agreed that the formulae were useful in connection with the remodelling of channels. Extensive studies have been made in the Punjab and in Sind to determine the relation that exists between the bed silt in the channel and hydraulic data of the channel. Two types of siltometers have been developed at the Irrigation Research Institute at Lahore and they are proving of great value in studying the characteristics of silt. The work done at Lahore has shown that the Distribution Curves for the bed silt in a silted, a scouring, and a stable channel have typical forms. A number which can describe a silt and which is a function of the weighted mean diameter of the silt particles is now being studied in connection with the hydraulic data of channels with the object of determining whether any relation between the silt and the hydraulic data exists. Results of these investigations will probably have an important influence on the design of channels and on cost of maintenance of channels already in existence.

At the conclusion of the discussion of the Agenda the Research Officer of Madras drew attention to the growth of weeds in channels in his Province, a subject which also appeared to be of considerable importance in Bengal. A solution of the problem would be of considerable economic value and the subject deserves intensive study.

### The Chemistry of Milk.

ONE of the important discussions organised by the Chemistry (B) and Agriculture (M) Sections of the British Association for the Advancement of Science at their last session was on "The Chemistry of Milk".

Dr. Tocher contributed a paper on the *Composition of Milk and the Present Regulations*. The proportions of the constituents of milk are known to vary widely from sample to sample even in the case of bulked milk. In the case of fat and solids not-fat percentages, it is known that many cases occurred where the values fell below the prescribed presumptive limits under the regulations. Several instances are known where *genuine* milk has been held to be watered. Various workers have found that the freezing point of milk is the least variable of all physical characters, the coefficient of variation being approximately 1.5 as against 4.5 for refractive index and 5.0 for specific gravity. On account of its low variability the freezing point of milk has been frequently used as a criterion for "watering".

In the course of his paper on the *Chemical Composition of Abnormal Milk*, Dr. Dabies said: "Abnormality in buffer value in the acid range, in the balance of acidic and basic constituents, in the distribution of ionic acid and non-ionic metallic radicles (Ca), in the amounts of the various forms of casein present and in the amount of heat-coagulable protein, is reflected by abnormality in rennet action, 'curd tension' and in heat stability at temperatures above 100°C.

Dr. Linderstrom-Lang contributed an interesting paper on *Some Chemical and Physical Properties of Casein*. "Casein (caseinogen), the phosphor protein in milk, is a mixture of two or more substances. By treatment with acid alcohol it may be divided into several fractions that differ in chemical composition, especially in their content of phosphorus. Mixing the fractions in their original proportions gives the original casein with its characteristic physical and chemical properties.

Investigations of the solubility of casein in acids and bases show its complex nature. The solubility is, under constant conditions, a function of the amount of casein present as precipitate, and the dissolved substances differ in chemical compositions from the precipitate.

The fact that casein is a mixture makes investigations of its chemical structure difficult. Due to its high content of phosphorus and the importance of this to nutrition problems, the mode of combination of this element has been the subject for elaborate studies. Experiments show that the phosphorus in casein is present as phosphoric acid and—at least partly—bound to serine by an ester linkage. As the phosphorus content of the different fractions of casein is different, this problem is of importance to the explanation of the above-named physical properties.

Other papers that came up for discussion were *The Composition of Milk Fat* by Prof. T. P. Hilditch and *The Vitamins of Milk* by Dr. S. K. Kon.