

REPORT OF THE JAPANESE AGRICULTURAL
SURVEY MISSION
IN
NEPAL

May 1970

OVERSEAS TECHNICAL COOPERATION AGENCY
GOVERNMENT OF JAPAN

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REPORT OF THE JAPANESE AGRICULTURAL PRELIMINARY

SURVEY MISSION IN NEPAL

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May, 1970

OVERSEAS TECHNICAL COOPERATION AGENCY

GOVERNMENT OF JAPAN

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FOREWORD

On request of the Kingdom of Nepal, the Overseas Technical Cooperation Agency was commissioned by the Japanese Ministry of Foreign Affairs to send a mission to Nepal for the purpose of conducting a preliminary survey on agricultural development.

A group of specialists in fields ranging from agricultural techniques to sociology and economics, organized under the leadership of Dr. Hitoshi Fukuda, Professor Emeritus of Tokyo University, arrived in Nepal on March 17, and remained there for twenty-eight days.

After one hundred years of isolation, the Kingdom of Nepal is now seriously tackling the problem of modernization. With ninety percent of her population being engaged in farming and with agricultural products occupying an important position in export. Nepal has naturally placed great emphasis on the development of modern agricultural techniques ever since she opened her doors to foreign countries. For Nepal, agricultural development means economic expansion.

In view of this situation, Nepal has sought for our cooperation in the field of agriculture. We presumed that Nepal considered Japanese agricultural techniques worthy of trust, and it was only after serious consideration that we decided to send the first preliminary survey team.

This survey team observed that in agricultural cooperation, the introduction of technical assistance should come after a sufficient understanding of the nature of the people and of the political and social situation has been attained. In the survey, the team investigated the situation there extensively, with a view to discovering the best possible way for cooperation.

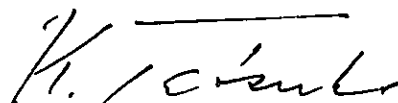
Because of the brevity of their visit and the incomplete nature of their survey, it was impossible to reach a final decision as to the extent and nature of the cooperation our country should give. But I think we can say that the general pattern has been decided.

We hope to send a second survey team at the earliest opportunity to complete the unfinished work and to make a thorough survey. The results of that survey, along with the present report, will help us, we hope, to decide a concrete program for Japanese cooperation in Nepal.

Cultural exchange has been taking place between Nepal and Japan for a long time and a close relationship has been existing between the two countries. I take this opportunity to express my sincere hope that the present bonds of friendship will further be strengthened and both countries will enjoy an ever-increasing prosperity.

In conclusion, I would like to express my warm thanks to the members of both governments who so kindly assisted us, and at the same time, to the members of the survey team who performed their arduous task within the framework of such a tight schedule.

Tokyo, May, 1970.

A handwritten signature in black ink, appearing to read 'K. Tatsuke', written over a horizontal line.

Keiichi Tatsuke,
Director General,
Overseas Technical Cooperation Agency

ACKNOWLEDGEMENT

Together with experts in the fields of sociology, economics, and irrigation, I had the honour of visiting the Kingdom of Nepal for the purpose of conducting a preliminary agriculture survey.

During our stay there, we were able to come to a better appreciation of the role that agriculture plays in economic development. We tried to discover, first, an area in which Japanese technical cooperation could be most profitably extended, and secondly, a way of extending the appropriate cooperation.

It is very important to find a way of efficiently spreading, on a limited investment, the knowledge of modern techniques among a large number of farmers. But it is not easy to plan the efficient use of the investment if a strict separation between the development area and the surrounding area is not observed.

With good fortune, I suppose most human desires could be satisfied if there were sufficient manpower, material and money. But when one considers the complex factors involved in agriculture—social, economic, and technical factors along with the factor of location—a development program which aims at overnight success is not to be desired. Rather, it would seem desirable to promote a graduated, flexible development program in which the farmers themselves are encouraged to express their own ideas, and in which experiments are repeatedly undertaken together with them.

At the end of this report, we have attempted to give our opinion as to how such a program could be actualized. We should be very grateful to receive the readers' impressions of our proposals. Unfortunately, due to various circumstances, we were unable to survey the entire area which we had originally intended to. We hope a second survey team will be sent at the earliest opportunity to complete the unfinished work.

I should like to express, on behalf of the members of our mission, my deep appreciation to those who kindly extended their assistance and cooperation, particularly to the officials of both Nepalese and Japanese Governments, the staff of the Overseas Technical Cooperation Agency. Enclosed herewith is our sincere hope for the further development of agriculture in Nepal, blessed with the assistance and cooperation of all offices concerned.

Tokyo, May, 1970



Hitoshi Fukuda
Leader, Nepal Agricultural Survey Mission

The Member-List of the Survey Team

Dr. Fukuda Hitoshi	Leader	Professor-Emeritus, The University of Tokyo
Mr. Kimura Takashige	Sub-Leader	O.T.C.A.
Mr. Matsumoto Takeo	Cultivation	M.A.F.
Mr. Nakamura Hisashi	Rural Society	Asian Economic Affairs
Mr. Goto Ryonosuke	Agricultural Economy	O.T.C.A.
Mr. Suwa Ryo	Liaison	O.T.C.A.
Mr. Shimada Teruo	Local Cooperation	Agricultural Specialist (O.T.C.A. Expert)

M.A.F. = Ministry of Agriculture and Forestry

O.T.C.A.= Overseas Technical Cooperation Agency

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I. GENERAL DESCRIPTION

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1. THE CHARACTERISTICS AND THE DEVELOPING TREND OF AGRICULTURE IN NEPAL

Among the countries where no better resources have yet been found than agriculture, there are two categories, in one category are those countries whose agricultural output is ample enough to meet the domestic needs of the country and to export the surplus as a prominent means of acquiring foreign currency; in the other category are those countries whose agricultural output another, is not yet enough to meet the native demands. Nepal, though its output is not satisfactory, may be enrolled in the former.

The kingdom of Nepal occupies an area twice as large as Hokkaido of Japan and has a population near to that of Tokyo, the capital of Japan. (area; 140,000 km²; population approx. 10,000,000). The number of farming households there is as high as 84% of the total number of households (1.77×10^6 estimated in 1966). 66% of the gross production derives from agriculture and forestry (mainly from agriculture), the principal products being paddy, maize, wheat and millet. The cultivation ratio is about 13%. The coverage of paddy is 62.0% of the whole cultivated land, that of maize 24.5%, and wheat 9.4%. The total amount of grain production is therefore divided into 64.5%, 25.1% and 7.1% respectively. The average amount of annual grain production is between 3,350,000 and 3,550,000 tons, which is enough to cover the native consumption, deemed as approx. 3,200,000 tons, enjoying the self-sufficiency ratio of 104% through 110%. The total amount of grain production in the year 1968 – 1969 soared up to 3,590,000 tons. Easily meeting the estimated amount of the domestic consumption, 3,190,000 tons, it could reserve about 400,000 tons for further supply of seeds and forage, and for exports to India and other countries. In return, it was able to import other goods necessary for life, such as clothes, spices, salt and petroleum.

Geographically, Nepal is divided into two parts, one being the Tarai plain adjacent to India, the other, the mountainous districts. Two-thirds of the whole population lives in the hilly area, while two-thirds of the grain is produced in the Tarai plain. The minimum elevation of the land is 61 m above sea level at the south-eastern part of the plain. The highest is 8,848 m, the summit of Mt. Everest, commanding the north-eastern part. The climate varies greatly, therefore ranging from semi-tropical zone to frigid zone.

The dwellers in the mountainous districts have in general disliked the semi-tropical climate, partly from fear of malaria, and so have avoided resettling down in the plain. Nowadays, together with the effects of anti-malaria drives, more highlanders are settling down in the plain where they can enjoy higher productivity. The transportation situation has gradually improved, but there still remains a good deal of dependence on either manpower or domestic animals for transfer of materials. Transportation of grains in bulk is naturally inefficient. Furthermore,

there are several factors which influence the national economy: the Tarai plain is higher in economical power than the mountaineous district; transportation of materials into India is easier from the Tarai plain than from the mountainous side; and railways along the border are well operated on the Indian side. All of these factors have long been effecting the marketing situation involving Indian people and Nepalese of Indian origin living in the Tarai plain. Each year has accordingly witnessed the export of a considerable amount of grains to India through these-routes.

If we should emphasize an area development within a certain country and deliverately keep balance on her distribution spectrum as well, we would be obliged to expedite the reasonable development of the less developed area, spreading from the central Tarai to the skirt of the mountains in Nepal. At the same time, further development of the plains which have been already developed to some extent should be urged.

Here in Nepal, we found it very important to foster a more balanced development of her economy, should we consider its great potentialities due to the favorable social and economic conditions of the land.

Nepal's land utilization is generally apparent in her cultivation, which is said to be one of the wonders of the world, transforming the land from north to south with the gradual transfer from livestock handling to orchards, and from orchards to agricultural cultivation. So praiseworthy is the time-honoured efforts of the farmers in cultivating the sheer slopes, having changed them into terraced fields or terraced paddy fields. These upland forms are gradully spreading down into the southern plain. It is known that about five years are required to get returns from cattle raising in Nepal, and three or four years from fruit-tree yields. Agricultural products, instead, can be harvested in one year, as seen in paddy, maize, wheat and millet. It may be quite natural for Nepal in its economic policies to focus its main efforts on increasing agricultural products under the title of agricultural development, though not neglecting growth in livestock and horticulture.

Here we must note the significant effect of her policies in producing better food and providing nutritious conditions for her people, in addition to the export of the surplus to acquire more foreign currency. In general, the ratio of food cost in the daily living expenses is comparatively high, showing poor in nutritions, particularly in animal protein, calcium and vitamin which are not attainable in grains.

The mission wishes to offer its deep respect to the efforts of the Government, having observed here intention to encourage fishery which is embodied in the increase of carp production.

Water, fertilizer, and good seeds are said to be worthy of investment along the line of economical policies of this country. There are indeed important to improve agricultural production, but are merely, so to speak, technical means. Without them, of course, no increase of productions, no development of economy could be expected. Nonetheless, we ought to put more emphasis on the fulfillment of various conditions necessary for social and economic life, as found in commodity prices, market and transportation.

(1) Irrigation and drainage

Generally speaking, irrigation and drainage enterprises comprise those operated on a national scale with large facilities, those on a smaller scale limited to a block or a district, and those operated on a private basis when both big and small work together in mutual cooperation, the biggest and the most effective result of their development will be brought forth. This is called cooperation between major and minor irrigation. The latter is comparatively easier to bring about and is now very important. One of the highest priorities is the settlement of water management at the grass root level by getting the cooperation and understanding of the farmers.

For this purpose, the following should be brought into consideration.

- a) Readiness of terminal functions of irrigation and drainage to complete the existing facilities.
- b) Expansion of minor irrigation; particularly important is ground water which is as usable as surface water.
- c) Organization of various Farmers' Association pertaining to water management.

(2) Diffusion of chemical fertilizer

Presently no better fertilization is generally used than compost made up of cattle manure, but there is a tendency to cover up with chemical fertilizer. It is strongly hoped to diffuse this tendency as a promising means of technical extension.

(3) Spread of good seeds

Growth experiments with good seeds are well observed at various research institutes for the enlightenment of farmers. Along with this, double cropping of the cultivated field or the winter season cultivated field or the winter season culture will be encouraged as a sure and speedy method for the promotion of agricultural products. Wheat and vegetables will probably be the leading items among the winter crops.

(4) Direction of agricultural development

The Government of Nepal has hitherto been orientated in the direction of enlarging agriculture with rice, maize and wheat as main yields. Then it turned toward comprehensive areal development, that was exemplified in the Government-advocated Intensive Agricultural Extension Program. A new development formula was first applied to Gandaki, backed with advice from West Germany, aiming at covering a wider scope than district-size. West Germany, has since been taking pains to introduce the formula, once successfully applied to the Mandi zone of India, into the Gandaki zone of this country again where advantages of ground and man-power were obvious.

Later, responding to the demand of remote development, the Government began to give attention to the development of the Mechi zone at the east end of the Tarai plain and the Mahakali zone at the west end.

With the view to extending the development efforts inwards from the above-mentioned two zones, development of the Seti zone and the Koshi zone, each being the second zone from the end of the Tarai Plain and located next to Mechi and Mahakali, came to arouse the concern with its so-called sandwich effect.

As above, various changes are seen in the concept of development, but the direction in general may be grasped along the line of spreading the agricultural techniques over a comparatively wide area, and simultaneously of reminding the establishment of the economic and social surroundings to make it easier to promote.

The mission has been much impressed by the Governmental efforts to secure the foundation of economic developments for the future of this country, having prepared many experiment stations in agriculture, horticulture, livestock and fishery. The mission was also in full support of the government's effort to increase such cash-convertible products as vegetables, maize, wheat and jute, in addition to rice, the staple food.

Here lies, however, a serious problem in order to get the best result of the development efforts; that is what kind of approach is most suitable for the diffusion of agricultural technique, which will at the same time keep the support of the farmers.

We look forward to the day when both the central and local administration organs joint in full accord to present the promotive body much stronger and more efficient than before.

2. ON THE PRELIMINARY SURVEY OF AGRICULTURAL DEVELOPMENT IN NEPAL

The government of Nepal turned in a request to Japan in 1969, asking Japanese technical cooperation for the betterment of her agricultural development. The focus of the request was directed at the embodiment of experimental extension farms to be established in both sides of the mountainous and plain area, the topographical feature of which is clear in Nepal, as well as at the areal development of agriculture on the plain. This focus appeared to aim, so far as we could understand, at inviting our cooperation rather in rural development with the emphasis on diffusion of technique among the local communities of farmers than in experimental research on agriculture.

The Japanese Government, having agreed to this proposed, trusted the task to the Overseas Technical Cooperation Agency. This survey team, consequently, was dispatched to Nepal for the duration of four weeks beginning on March 17, 1970. We, members of the team, thought, first of all, that it was imperative for us to comprehend the general principles of Nepal's economic development policy and to become aware of the orientation of agriculture in her economy, and as well, to find out the appropriate formula of cooperation in the most desirous area, considering the extent of cooperation technically available to Japan.

It turned out, however, that there has already been laid the Rapti Experiment and Guidance Farm in the Chitwan Area under the guidance of Tokyo Agricultural University, though the area was nominated by the Nepal Government in the said request.

This experiment farm has, since 1966, been working in various proceedings, as in the cultivation of paddy, wheat, maize, potato and vegetables, and in the introduction of seeds and young plants, and furthermore in demonstration and diffusion guidance. The water resource there only depends on the small amount of that flowing out of the Narayani River terraced hills. The extension of water-resources is considered so important that the whole future of the agricultural development depends upon it. The fund resources of this farm is not from that university but from international organization or private donations, led by SCI (Service Civil International in Switzerland), OXFAM (Oxford Committee for Famine Relief) and the Japanese Government as seen in sending an agricultural specialist there. The amount of funds, however, is so limited that it is feared that it will die out in the same way that the water supply is.

The mission, as mentioned before, has the role of providing technical cooperation for Nepal, and to do it in such a way that it will be agreeable to both parties. We can not be satisfied with simply lending a help toward to the farm of Tokyo Agricultural University.

The mission, mindful of this situation tried to discover the best possible project that the Japanese technical cooperation could offer, confirming its efforts to the survey objective facts and to the study of data without any preconception.

Mr. Teruo SHIMADA, representative of this university farm, concurrently a Colombo Plan expert dispatched from the Japanese Government, kindly participated in the activities of the Mission, which deeply indebted to his valuable contribution as an able member of to the Mission in advising from his precious experiences in Nepal and with his smooth arrangement coping with transportation inconveniences in air and land which were observed often there.

It goes without saying that he cooperated with the Mission because he understood the aim of our activity.

Technical cooperation for agricultural development has formerly been apt to become merely an enterprise of a demonstrative and expositional character, not so practical as to spread the results over the farmers in general, and not applicable directly to the improvement of agricultural production and rural life as well. To avoid this, the Mission ought to set the objective of this time cooperation for Nepal's agricultural development on such technical cooperation that would be acceptable by common farmers and as extensible as possible. To realize it, it will be necessary to introduce improved technics into this country and to align social, cultural and economic conditions of this country so as to back up the agricultural development on an overall basis. The area that would make the above feasible must be selected.

3. FIELD SURVEY

Out field survey was held in a short period of four weeks but fortunately resulted in substantial gains thanks to the goodwill and support of the Nepal Government. A partial cut down of our itinerary was necessary, and there were local circumstances preventing us from moving around in one group which had originally been thought necessary in order to make an overall survey on a certain area with as many specialists as in irrigation and drainage, cultivation, economic and social situations. The barring reasons were due to transportation troubles.

Prior to our departure from Japan, the Mission had made preparatory studies on the agricultural status of Nepal, mainly listened to the lectures of those versed in the local situations. The Mission could then harbour a tentative supposition that the best cooperation for agricultural development there would be the kind of support to the areal development centered around the efficient reformation of the local agriculture. This revealed later to be identical to the aim of the request sent from the Nepal Government before.

The surveyed areas, in the order in which they were surveyed are as follows.

- (1) Chitwan area
- (2) Janakpur area
- (3) Kankai area
- (4) Gandaki area

Below are shown our general views on each areal feature from the standpoint from the purpose of the Mission.

(1) Chitwan area

This area belonging to the Narayani zone, one of the 14 zones of Nepal, is made of three terraced hills with the big river Narayani running from the north-east side of the area through the direction of south-west. (This river, named also the Gandaki, takes in one of its biggest branch rivers, the Rapti river.) Once notorious for being menaced by the fearful malaria, the Rapti basin succeeded later in her anti-malaria drives supported by the United Nations and has now changed herself into a typical example of areal development in Nepal, with more and more farmers settling down from the highland, enjoying her land reclamation under the assistance of the U.S.A.

Our survey was carried out over the area including the experimental farm of Tokyo Agricultural University and the Nepal Government's horticultural experimental station.

The land height is approx. 230 m a.s.l. From the standpoint of water availability, there is a major plan already commenced though partially. Even those minor plans of digging new wells, pumping up and conveying from the Narayani, and intaking water from the branches of the Rapti, are all considered useful, but one of the promising methods would be pumping up water after connecting the minimum distance between the Narayani and the already-existing channel (though now out of order). Another method that should not be neglected would be utilizing the ground water in the district nearer to the Janakpur zone.

From the point of view of cultivation, this area is far more subjected to change of weather, particularly of air temperature, than other areas belonging to the southern Tarai plain such as Janakpur and Kankai. This means the high probability of application of what techniques set up here toward the more leveled south and the more hilly north. This area, abundant in ways of cultivation and in kinds of crops, may be said to possess the feature of offering lots of models for farm management. Furthermore, the three terraced riverside hills made by the Narayani present good conditions

for experimental research on the relation between crops, soil and rotational farming, which in turn, compose the basis for easier expansion of such techniques as to require water management.

This area, of comparatively recent cultivation and colonization, is little bothered by traditional burdens and seems rich in what so called "social mobility". Dwellers are rather high in educational career and have a willingness to tackle the problem of development positively. The cultivated land is mostly shared among farm-owners, with only 20% of the area on the shoulders of tenants. The tendency of marketing the products is considerably high, probably for cash revenue, and yet no heavy encroachment by local merchants is observed here. The Nepal Government is now clearly inclined to get further diffusion of cultivation technics backed by proper water management.

(2) Janakpur area

This area lies in the Janakpur zone, comparatively in the eastward section of the Tarai plain. Our team proceeded along the landroad from Narayani zone keeping watch on the districts near Janakpur City. Being one of the early developed areas, comparatively strong influences of India that were prevailing over the Terai as a whole are observed here.

From the point of view of irrigation, these are minor intaking facilities of river water at limited lots. The function, however, particularly that of facilities to make water run through to the terminal from the main canal, is likely improper. The prominent water resources in this area may be on the development of artesian ground water. There are some now in use and some under planning. Both the topography slanted toward the south with the degree of one-six hundredth and geographical judgment urge us to a strong demand for the reasonable future development of ground water. The surveyed area stands at 120 m a.s.l. The agricultural experiment station, established by FAO, has already been working to seek after the reasonable cultivation technics of rice and wheat, accompanied with the toilful experiments on water requirement. Another, established by the Government, seems to be following the new seeds, for its main task is to promote the use of new techniques among nearby farmers.

From the point of view of cultivation, kinds of production are fewer than in Chitwan area. With rice atop, wheat, maize and jute of the eastern zone remain only secondary among the products. The necessity of strengthening terminal facilities of irrigation, and that of field consolidation, are both felt keenly here at the Tarai, although seemingly it is the same all over the country. The soil fertility here is not favorable, because of the age-old cultivation and of the inferior fertilizing technics, so much is need of fertilization in large quantity in order to raise up her productive power.

Indian influences appear here strong socially and economically. Traditional customs, too, seem to nestle deep among the farmers. Sales of the main produce, rice, is apt to be controlled by the ricepolisher under the colour of all-in-one community, making one village one community. To spread moderate facilities of mill, ricepolishing, and oil-raising, and the concerned structure to return profits directly to the farmers, is considered imperative here in the Tarai plain as in the other zones.

(3) Kankai area

This area lies at the Koshi zone, in the east-most part of the Tarai plain. This falls upon the planned area of the so called "Kankai Project". As for major irrigation, here covers all of the storage dam, diversion dam and canal system. A part of the covered area, approx. 46,000 ha wide, is yet occupied with jungles. Here and there are seen minor irrigation setups not better than the level of drawing water by damming a stream. The features of the area, seen in cultivation, economy and community, are similar to those of janakpur area. Only the difference may be found in the rotational system involving jute, a special product of this area.

(4) Gandaki area

This area belongs to the Gandaki zone which embraces Pokkara, the famous gate to the Himalaya. It has already been under agricultural development with the help of West Germany, whose unique formula of areal extension of technics is now prevailing. This area, therefore, is for us rather to know their ways of extension than to survey by ourselves. Their headquarter was founded at the Khaireni village, 35 km south-east from Pokkara. There are four districts objected for diffusion of technics covering the cultivated field in all of 80,000 ha. The land is 800 m high at Pokkara, and 600 m high at the headquarter.

The station is composed of four specialists from West Germany (majoring in farm management, agronomy, farm machinery and mechanics and two more specialists in irrigation and fishery are expected to join in the near future) and of eight specialists from Nepal, accompanied by seventy or eighty JTAs (Junior Technical Assistants).

The formula of cooperation extended here is the same as the one that has already been held successfully at the Mandi area of India under the guidance of West Germany. The aim of this formula is to spread a kind of cultivation technique, laying stress on fertilization, over the wide area of agriculture. The main products for the present are rice in the wet season and maize in the dry period, and under consideration is wheat.

There are five centers within the area outposted with twelve store houses for stocking material and equipment (the coverage of a store house is 2 ha wide). Each JTA is responsible for a unit of villages composed of about 200 – 300 households.

Diffusion of technics is under-taken by the influential farmers of each unit. Their works are channeled from the headquarter to Nepal specialists, from them to JTA. They have no direct connection with those administrative organizations or cooperative societies of a village and think it better to spread from the connection between JTA and the farmer.

No emphasis has been put on the setup of the major facilities of water utilization for the time being, due to their focus of diffusion set upon fertilization technics. Here in a mountainous district like this, which is comparatively favored with streams, it is not so difficult to meet the water requirement; though not sufficient, it is enough to cover the allotted area. The minor ones such as simplified intakes from the rivers are earnestly sought after. The typical demonstration is done on tests of fertilizers and crop species under the guide of JTA, after borrowing a lot of 25 m² from a cooperative and capable farmer. This kind of test plots are numerous wherever land conditions are different, making it a nucleus of extension.

More than 90% of the farmers here are fortunately owner-cultivators. Many of them are literate, being ex-servicemen from Gurkha regiments, to their advantage of areal development.

Here, also, is given training for agricultural technicians under the guidance of West Germany experts.

JTAs, on finishing high school, receive an agricultural education at Kathmandu under the auspices of the Ministry of Agriculture and Food for the duration of one and a half years. Then they are allotted to various places to continue a refresher training course. At the Gandaki area the training meetings are held twice a month, one at the headquarters and another in the field. This project has not yet experienced more than two years, so one is looking forward to the coming results in this country.

So far I have outlined some characteristics of the area surveyed this time. We intended at first to add the Seti zone at the west side of the Tarai plain into our object area in accordance with the arrangements offered by the Nepal Government. We have studied the extension of our itinerary for this purpose. But, to our regret, owing to the transportation problems as mentioned before, we could not carry it out. Besides, we could not make a definitive survey of the places considered as possible sites for ground water, in the south-east part of the Narayani zone.

After surveying as many promising areas as possible the best should be selected, because a project mainly is destined to success or failure at the time of area selection.

4. JAPANESE COOPERATION IN THE AGRICULTURAL AREAL DEVELOPMENT IN NEPAL

Area selection for the sake of agricultural development and contents of the development to be applied here-upon should of course be agreeable to the economic policy of the country. The substance of areal development, furthermore, will demand that each component factor of the area be harmonized. Even a single factor, for instance, agricultural development, should always be related to the other factors in the whole area.

To talk about a policy, there are many items to consider, such as capital, scale and order of technics' investment. For example, the size of an area will vary depending on whether it is international, or local. Generally speaking, the scale of a development unit will be inefficient if it is too small, and the question of where to begin first will arise if too large. Therefore, one possible approach will be around the scale that farmers could cooperate efficiently by making an organization among themselves, in other words, the extent that their cooperative association could function well or that it could operate with facility as a federated body. Needless to say there remain other factors to reckon with, say, the ability of the extension service members and the situation of the farmers. In these cases, social and economic conditions are more important than technical ones.

The boundary lines between areas were apt to be kept strictly in general, but it would be desirable to make them less rigid from the standpoint of enlarging the development efforts more smoothly. In the Gandaki Project now under cooperation with West Germany, there is scarcely observed any gap or discontinuance between the object area and other fields.

Next, the periodical length of development from the start to the goal will better be a term of such a size to project into the future what was gained during the immediate past, rather than a long ranged term which would involve a certain assumptions and aspirations. It might be safe to say that any project would need around five years or so if it be expected to bear sure fruits.

Meanwhile, the area is always changing. Taking this into consideration, we shall have to divide our strategies in two categories; universal and special. The universal are mainly for technical or basis applicances as in transportation, irrigation and drainage works and other public facilities. The special ones are largely connected with social and economic factors, so no methods are reliable other than the actual survey and analysis held at the competent area.

With the above thoughts as a background, all members joined in a discussion on how to offer Japanese cooperation in the agricultural development in Nepal. Two of the team members (FUKUDA and KIMURA) had participated in the community development project held recently in Ceylon under the mission of technical cooperation.

The cooperation methods applied then are worth study and very interesting if compared with those of West Germany.

(1) Japanese Cooperation to Devahuwa area in Ceylon

The dispatched team decided to secure modern agricultural technics there and spread them within the area by improving the infrastructure into a sizable scale of villages in order to make the best use of funds, material, equipment and advanced technics. They tried also to improve the activities of farmers' associations and cooperatives as much as possible. Thus they concluded it was most feasible to expand any results into the neighborhood and farther so that the project might be of use for the agricultural development in Ceylon. Our formula was to make use of the farmers' systematic activities for the extension of technics, and they urge possible reformation on a part of land system. As such, our object area had to be limited, to a certain extent, under the requirement of infrastructure readiness.

(2) West Germanys' cooperation to Gandaki area

With emphasis on the diffusion of fertilization techniques, Development efforts have been made with individual influential farmer. Their method is to associate directly with farmers, having no immediate relation with the farmers' organization or administrative channel. They were anxious to get minor irrigation facilities, while naturally hoping for the early construction of major ones. Their way of thinking toward the dimension of the object development was very flexible as they were not effected so much by the conditions of readiness in infrastructure.

It goes without saying that they expected the technics not to be hindered from expansion by social and economic conditions. Favourable conditions, for example, were seen in the fact that the majority of the farmers in the area are owner-cultivators and that there is a big social mobility around the area. West Germany's experts, however, seemed to have given greater weight to the basic reformation of technics rather than that of land system.

(3) Japanese technical cooperation to Nepal

Basically, it is desirable that a similar formula of technical cooperation be applied to the Devehuwa area in Ceylon. Unless the desired conditions in this area are met with, no success could be expected in the development. Still, we can find good references in West Germany's formula in the time-process to satisfy these conditions one by one.

There is a popular saying nowadays - - - - provide, first of all, the three Ms. that is, man, money and material. Whenever these are present, a great deal of human desires could be fulfilled. Indeed they are the necessary positive conditions, but cannot

be found any where at any time. It is desirable to use money and material, limited as they are, as widely as possible in a diffused way so that we may expect further expansion of technics with less trouble caused by the acute differences between the cooperated area and the outside. We must, therefore, select a large area for our project to make better use of our two advantages - - - dispatch of technical experts and supply of needed material. We ought to start from the minor stage in the subject of infrastructure and to call for farmers' concern on the redimentary reformation of cultivating methods. We should then plan the gradual utilization of the local conditions in accordance with the degree of investment for such purposes.

With the above taken into consideration, I should like to suggest the establishment of (a) Extension farms (b) Extension plots in the widest possible area. Our aim, of course, is to enlighten farmers with the maximum effect of our technical introduction, but at the same time, to try to collect as much basic data as possible for development together with the data needed for the diffusion of new technics among the farmers. The above mentioned "Extension farms" will be managed under the guidance of experts both from Nepal and Japan. The data needed to train numerous JTA (covering fertilization kinds of seeds, water control and other guidance on cultivation) will also be collected. The location of these farms may be settled where the soil shows differences in the geological system (as it is uncontrollable by human hands). The above described "Extension plots" may be settled where the land-use history shows differences in the results (as the soil here is figured artificially and controllable by human hands). They are identical to those test districts established in Gandaki area under cooperation with West Germany. The number of plots naturally is bigger than that of farms. Whether to use farmers association or cooperatives for the means of extension or not, will be decided according to the social and economic feature of the area.

As for the introduction of modern farm machinery, it will mainly be used at first on Extension farms in order that specialist might get the required data as quickly as possible. The demonstration effect will be given consideration later so it is not expected that the more efficient machinery will spread over the area from the beginning. We would like to think from this standpoint, about the introduction of other equipment, rice-polishers, mills and oilmanufacturing and so on. Further, we look forward to the day when the farmers will become interested in such machinery and agricultural productive facilities and be voluntarily inclined to purchase them themselves.

Meanwhile, it is hoped that specialists will make efforts to reform traditional agricultural machinery, the work of which as hitherto been done by animal power or man-power, and to find a way to mass-produce good green manure and compost to supplement the farmers own supply system.

With this in mind, I find myself interested in finding a flexible means to maintain a steady pace in the agricultural development. I would like to adopt a program in which the farmers themselves are encouraged to express their own ideas and in which trials are repeatedly undertaken together with them. The formula of development, in such a case must be flexible, progressive, and adjustable to any situation so that it may find out the best possible solution by itself against whatever hinders us. What I want to say is ——— Development is the father of development. Through things strengthen themselves out in time. This kind of methodology may be one logical way of doing things.

In conclusion, this survey team had to curtail the original survey plan for various reasons as mentioned in the chapter on Field survey. As a result of our visit, however, our interest has been awakened in the Chitwan area of the Narayani zone as a possible site for the introduction of Japanese technical cooperation, based on the careful study of cultivation, water utilization and various social and economic conditions in this area. We are inclined to say that the secondary preparatory survey team would best be sent to survey the area not as yet covered (the West Half of the Terai plain and some other areas which are promising for ground water) and to make a comparative study of the whole area in general in order to select the best possible area for Japanese cooperations.

1. RURAL SOCIETY

(1) Chitwan Valley Area

Until the 1950's, Chitwan Valley was the haunts of tigers and rhinoceroses and provided the country's best hunting ground. With the establishment of the Department of Rapti Valley Multi-purpose Development, the Government directed its efforts towards extermination of malaria and other infectious diseases, and embarked on the resettlement programme of inhabitants in mountainous districts (Pahaliya) which was completed in 1966. As its agricultural development was initiated only a couple of decades ago, the area has one of the smallest population densities in the entire Tarai Plain. ¹⁾

Prior to the commencement of the Resettlement Project, the area was inhabited by a small number of aboriginal tribes known as Tharu and Chepang who resorted to shifting cultivation and hunting for living. Farmers who settled themselves in the area after the Nepalese Government set up and promoted the resettlement policy are mostly from the mountainous districts such as Gorkha, Lamjun, Thanasu, Palpa, Sayanja, Pokhora and Baglung which are all found upstream of the Narayani river. These settlers can be divided, not from the strict standpoint of physical anthropology but by broad classification, into two social groups, the one comprising tribes that belong to the Alps-Mediterranean Race and claim themselves to be Aryans, and the other consisting of Mongolian races such as Gurung, Tamang, Rai, Limbu, Ghale, Magar and Ghalti. It is believed, however, that farmers from Kathmandu Valley, who belong to the Newar tribe, are a mixed race of both. Insofar as the population is concerned, the Mongolian races surpass the other and occupy about 70% of total inhabitants in the area.

It is said that Mongolian races could be clearly discriminated from Indian (Aryan) races because the former were Buddhists and the latter Hindus. This distinction, however, is no longer practicable because the intercourse with India over many years in the past has caused Mongolian inhabitants from mountainous districts to be assimilated with the Hindu society and now Hinduism is more prevalent among them than Buddhism. As the assimilation with the Hindu society progressed, social groups belonging to the Mongolian race in which the caste system was absent came gradually to recognize themselves and be recognized by others as belonging to certain classes of caste. The religious life is diversified among the Mongolian inhabitants and embrace even the animism and fetishism inherent to the Tharu. What characterizes the religious life of the inhabitants of the area is the fact that there can hardly be observed conflicts between religious or sects of a religion often withseed in India and Ceylon, and that Buddhists and Hindus are in amicable coexistence without being bound in their daily life by their respective religious devotions. daily life by their respective religious devotions.

On the other hand, the caste system in the Hindu society has no such strict class distinction as observed in rural area in India. Instead, it is broadly divided into the higher caste (Bahun, Chetri, Takuli, etc.) and the lower caste (Lohar, Kami, Damain, Pasi, Sarki, Chame, etc.). The social group belonging to the Mongolian race appears to be often classified between the higher and lower caste, though this classification is not definite. Most of vocational caste are classified as the untouchable. As the area is the resettlement land, there can be found hardly any Hindu joint families, and the family life is carried out by the nuclear family. Further, the discrimination between castes is much weaker than in other areas. It is reported that people belonging to different castes, except for those who are classified as Sarki and Chame, the lowest classes, have meals together and inter-marry.²⁾

Many of farmers who possessed funds for farm management and settled themselves in high spirits are either retired Gurkha soliders who had served in the British or Indian army or labourers who had worked in Burma. They have no formal school education, but their level of knowledge and intelligence is fairly high, and they are eager about education of their children.³⁾ Their experience in foreign countries and the exchange among themselves of such experience have enlightened them on many things and helped them to become quite willing to tackle the new farm management. Even farmers who have no experience of working in foreign countries do not show much adhesion to their traditional farming operation and are quick in absorbing new agricultural techniques because they threw themselves in the entirely different type of farming in Tarai with their experience in mountainous districts. Brahman settlers who work with a hoe or keep poultry against their religious taboo are found in larger numbers than in any other districts.

Although the existing 88 agricultural co-operative societies do not contribute much to the agricultural development of the area at present, Chitwan is the origin of the co-operative movement in Nepal⁴⁾, and settlers, have not loss their inherent willingness to cooperate voluntarily with each other for elevation of agricultural, productivity. This willingness is well manifested in the construction of 13-mile long Juglei Canal which required a five year period from 1961 to 1966 and a cost of 110 thousand rupees and labour force both offered by beneficiary farmers. Construction of this scale by voluntary service is not conceivable in other districts of Tarai particularly because it was planned and completed by the initiative and efforts of farmers themselves. Existence of village assembly (gram sabha) in almost all villages is the basis of farmers' organizations functioning with the voluntary cooperation of respective farmers, but it has nothing to do with the Panchayat, the official administrative organ, nor is it invested with any official authority. This traditional village assembly which is supported by the spontaneous will of farmers will apparently play an important role in the development of farmers' associations. It may be added that Panchayat Training Institute located at Rampur is likely to serve as an incentive to the voluntary organization and activities of farmers.

About 20% of arable land in Chitwan is cultivated by tenant farmers, and this figure is lower than in any other districts in Tarai. Further, since the area is a resettlement land, complicated land tenure is not found and the ratio of landless labourers is also small. Farmers are prohibited to divide their cultivated land allocated by the Government for resettlement (against payment of Rs. 90 per ha, payable over 10 years) into areas smaller than 2.67 ha for selling or concession. In actuality, however, fragmentation of resettled land is in progress in the form of inheritance of property.⁵⁾ Since the employment opportunities other than by agriculture are limited, the resettlement policy is not necessarily strictly adhered to, and this is causing the farmers to be disintegrated into different social strata. Further, squatters who clear the jungle and reclaim it into arable land without the Government permission are incessantly threatening the preservation of nature even after 1966 when the allocation of resettlement was suspended. As a result, cultivated areas occupied by illegal settlers now exceed the resettlement land (4,355 ha). For this reason, land prices made a spiralling increase until the selling price in 1969 marked Rs. 5,250 per ha for lands even without irrigation water and Rs. 12,000 per ha if irrigation water is available.

Most farm households operating more than 3 to 4 ha employ attached farm labourers who are usually provided with meals and clothing and paid about Rs. 250 – 400 in cash annually. In ploughing and harvesting seasons, farmers mutually cooperate by offering their work force in turn (*arumaparuma*), but it never meets the demand of each farm household. In consequence, practically all farm houses are compelled to employ daily labourers against payment of Rs. 3 – 4 for men and Rs. 2.5 – 3.5 for women per day. And it is often the case that the demand for farming labour at the peak of farming season cannot be met by temporary laborers in respective villages (mostly belonging to the Tharu) and seasonal labourers from India are largely depended on. Wages paid to these Indian labourers are reported to amount to about 1.3 million rupees in total each year in Chitwan District alone. Because of the frequent shortage of labour force, farm households cultivating more than 6 – 7 ha in this district are all eager about introduction of small type farm machinery.

Due to the virtual absence of farm roads, the bullock-cart is the only transport means other than man's shoulder. Livestock breeding is in wide practice for ploughing and fallowing operation and to secure the supply of animal protein (cow milk and goat meat). In the case of Kolyampur village which has a population of about four thousand, approximate number of respective domestic animals totals 1,400 heads for bullocks, 1,000 heads for cows, 400 heads for he-buffalos, 1,100 heads for shebuffalos, and 500 heads for goats. Grazing the cattle has been the job of children, but the rapid extension of school education (mostly primary education up to the five-year grade) in this district is now presenting the problem of securing the labour to take care of livestock. If no solution is brought to this problem, the spreading school education is liable to be enjoyed only by the limited upper class.

All farmers in the Chitwan Valley Area expressed a unified opinion that the largest obstacle lying in the way of the desired improvement of farm management is the lack of irrigation facilities. Other impediments they cited are the lack of stabilized markets, roads, veterinary surgeons, fertilizers, and funds. The Mission received the impression that surplus income of farm households goes first to cover the expenses for building a new house, then for education, purchase of livestock, purchase of land, and buying radios and other durable supplies.

Since the Chitwan Valley is a resettlement area, the Mission noticed no changes in the relationship between land owners and tenant farmers that could have been created by land reform. It is to be regretted that the Land Reform Compulsory Saving System enforced with the land reform was suspended one year ago because it was hoped to serve the purpose of saving petty farmers from the bonds of rice-millers who advance loans at high interest rates. To foster the financial footing of farmers for improvement of their farm management, it is desired that the re-organized Compulsory Saving System be put in practice again so that petty farmers may be allowed to obtain the necessary funds at reasonable rates of interest.

In Chitwan Valley Area, the Tokyo University of Agriculture Experimental Farm has engaged over the past several years in the extension of improved agricultural techniques. The outcome of its endeavours is being accepted by farmers in the neighbourhood and is also about to be extended among farmers in distant places. Provision of irrigation facilities and fostering of extension service are therefore to be promoted in this area.

(2) Janakpur Area

Dhanukha District where the Mission conducted interviews with farmers is not an inner Tarai district like Chitwan Valley, but its villages and cultivated lands are open to the border line with India. These flat cultivated lands farther extend beyond the border line to the Ganges Plain. Due to this topographical feature, the life of inhabitants in mountainous districts of Nepal can be observed in the northern jungle zone, and in the area extending southward from a point about 10 miles north of Janakpur City, farming communities and even the structure of houses closely resemble those in villages of Bihar State of India. Further, as the distance to the border line decreases, the influence of India becomes stronger to the extent that inhabitants of certain castes (specially minority castes) make it a rule to seek the spouse of their sons and daughters from across the border line. In consequence, it often occurs, that inhabitants in this area are more intimate with Indians belonging to the same caste as theirs than with Nepalese of different caste. In addition, the language they use in daily conversation is not usually Nepalese but

a dialect of Hindi (called Matihili) which is spoken in a part of Bihar State, though Nepalese is gradually gaining influence among them through the media of radios and newspapers.

With the exception of the Magar and Tamang tribes who live in the northern hills, practically all inhabitants of this area are of Indian descent. An overwhelming majority of them including the Magar are Hindus, though a few Buddhist, temples for the Tamang are found in the hills and a small number of Moslems (less than 5% of total population of the area) live in their own residential place in Hindu villages on the plain. It is often observed that dhobi shops in villages are run by Moslems.

The caste system is quite similar to that in villages of northern India, and there are many kinds of vocational castes.

The caste system in Dhanukha District is characterized by the fact that the leading caste is the Yadav, the population of the Brahman is very small (approx. 1%) and the Teli (oil dealer) holds a high position in economic activities of the district. The social life of villages is bound by the caste system which exerts a far stronger influence on farmers than in the mountainous districts or inner Tarai. For instance, the poultry raising is totally forbidden to ordinary caste Hindus and is therefore left entirely in the hand of Moslems. Intermarriages between high and low caste are seldom seen. Social position of women is very low due probably to the custom of infant marriage which is still in existence. In many villages, there are no or very few girls attending schools, and people believe even today that woman should keep herself away from the eye of all men except her husband⁷⁾ though the pressure of field work does not actually allow her to do so.

Education is generally claimed to have achieved the best results as compared with the development of other fields during the past two decades, yet the literacy rate of inhabitants (men only) does not exceed 15% (in 1951, the rate stood at 0.5%).

There is a non-governmental college (Ramaswrupa Rama Sagar Mehavidyalaya) with about 500 students in Janakpur Town. Since the courses covered by the syllabus of this college are limited, students who wish to receive higher education (particular science and technology) find it imperative to study at colleges and universities outside the district. Most of these students go to schools in Patna and other Indian cities rather than those in Kathmandu for reason of expenses and transport convenience. University education in India or Kathmandu demands a monthly expenditure of Rs 150 – 200 per student which is a very heavy burden for ordinary owner cultivator. The Mission interviewed a Yadav farmer with a family of 25 members who cultivates about 11.5 ha land of his own in the vicinity of Janakpur. This farmer had a son in the final year (Science) of the

Tribhuvan University, but all other members of his family received no school education except for two boys who only finished the two- and four-year primary education. Thus, the labour of more than 10 family members is required to support the education of one university student. This family was a typical Hindu joint family in which eight couples and their children who covered four generations live together on a common family budget. The Mission learned that this type of family system is rapidly going out of existence because it largely hampers smooth and rational economic activities.

According to the data obtained at Janakpur Office of the Land Reform Department, 457 ha of land in the Danukha District was expropriated as being in excess of the limit area allowed to be owned by farmers under the laws and regulations of the Land Reform. This expropriated land is not redistributed among tenant cultivators yet. Since the area of the expropriated land was less than 1% of total cultivated land (71,242 ha) of the district, it may be said that the land reform produced virtually no changes in the relationship between land owners and tenants. As of the end of March 1970, land cultivated by tenants was 34,285 ha, and owner-cum-tenant farmers cultivated 8,033 ha. This means that as large as 60% of total arable land of the district was cultivated by tenants and tenant-cum-owner farmers.

From the standpoint of land ownership, the constituents of farming communities can be classified as follows.

(a) Absent land lord

Absent land lords live in cities and come to collect the rent (in crops) in the harvesting period. Most are large land owners.

(b) Resident land lord

Resident land lords are middle and small owners living in respective villages. They can be sub-classified into those who do not participate in cultivation at all, and those who cultivate a limited area of land.

(c) Owner farmer

Most of owner farmers employ one or two farm labourers (Haruwa) and one cattle caretaker (Charuwa). These labourers are employed on live-in or similar conditions.

(d) Owner-cum-tenant and tenant

(e) Agricultural labourer

Agricultural labourers have no rights at all to land and make their living by earning wages (which are mostly paid in kind with meals). Most of them belong to the lower caste, and can be sub-classified into daily labourers who offer their service on a day-to-day basis, and permanent farm hands (Haruwa Charuwa) who work under a long term contract with the employer.

Under the existing conditions, it will entail many difficulties to introduce new and improved techniques for productivity elevation since the constituents of farming communities belong to different classes and the interest of one class does not coincide with that of another. It is therefore considered essential that a land reform or agricultural reform be mapped out to establish a system under which the benefit of production increase can be equally distributed among all who directly participate in production activities.

Class organizations intended for improving livelihood by the farmers' own hand were noted to be established in each village apart from the agricultural co-operative societies. Insofar as the Mission observed, however, these organizations appeared to have stopped functioning without making any noticeable achievements.

Unlike Chitwan Valley Area, the population mobility in the neighbourhood of Janakpur is said to be characterized rather by the inflow from India than by the migration of inhabitants in mountainous districts into the southern plain. The Mission was informed that peasants and agricultural labourers of the District crossed the border line for jobs in the slack season and even went as far as Calcutta in the past years. At present, however, idle labour force in villages is fully utilized for the construction of the West-East Highway and of the metal road connecting it with India. The construction of these two highways is concurrently in progress with the financial aid of the Soviet Union and India, respectively.

The land price ranges from Rs. 6,000 to 12,000 per ha in irrigated area and is about Rs. 3,000 per ha in non-irrigated area. The price increases as the distance to the Indian border decreases. There is an instance where Rs. 19,500 was paid per ha of paddy field near the Indian border. Transactions of land, however, are not very active. Durable supplies excepting bullock-carts and bicycles are hardly found in any farm households. Most farmers interviewed stated that if they have a surplus income they can spare, they would spend it for education of their children, building a new house, purchasing clothes, food and farm equipment, and drilling a well rather than for obtaining land.

It deserves attention that the coordination between administrative organs in this District is smoothly carried out. In 1966, the District Agricultural Coordination Committee was established with the participation of the District Agricultural Development

Office, the District Agricultural Co-operative office, the Agricultural Development Bank, the Agricultural Supply Corporation, the Land Reform Office, the District Panchayat and two representatives of farmers. All the problems relating to the agricultural development in the district are examined, discussed and coordinated by this committee. This smooth coordination between administrative organs is not observed in other Districts.

Janakpur is well known to Hindus as the birthplace of Goddess Seetha. It is expected many pilgrims will visit this holy place when the arterial roads are completed shortly. The expected visit of Hindu pilgrims will perhaps bring about some important changes in the existing social and economic life of the area.

(3) Kankai Area

As is well known, the pattern of farm management and social life in Nepal presents a larger change by the difference in elevation than by the distance in horizontal direction. If villages are situated at the same elevation within Tarai Plain, the pattern of their farm management and social life presents only a minor difference. Farming communities in Kankai Area which are located within Tarai Plain are therefore basically the same in characteristics as those in Janakpur Area. The following description deals with some features that differentiate Kankai Area from Janakpur.

Jhapa District which covers the flat land of Mechi Zone is divided into two districts by the Kankai river. On the west bank of the Kankai, there still remains a considerably wide jungle area where the government-owned resettlement company is engaged in reclamation work. The scenery on either side of the West-East Highway is such that would remind one of Rupti Valley 10 years ago. The area extending on the eastern side of the Kankai is almost all occupied by villages, and does not seem to allow the resettlement of new comers.

What distinguishes this area from Janakpur most markedly is the widespread cultivation of jute for export which has enhanced the penetration of money and commodity economy, and in consequence, accelerated the stratification of peasantry. Jute is the main source of foreign exchange earning in Nepal. About 75% of hard currencies is obtained by the export of jute. Jute is processed into finished product of Biratnagar in the adjoining District and exported through Calcutta, and about 60% of its export value in foreign exchange is allocated to jute exporters under the bonus system. This bonus system is serving, on the one hand, as an incentive to production increase in competition with the Indian jute, but is causing, on the other, undesirable commercial practices including the illegal transaction of foreign exchange.⁸⁾

Inhabitants of the existing villages are basically of Indian descents, with a few Rai, Limbu and Newar tribes who are from mountainous districts. In areas closer to the border line in the south, an agricultural caste called Rajibhansi becomes dominant in number. Religion of the inhabitants inclusive of Rai and Limbu is predominantly Hinduism, and as in the case of Janakpur, no Buddhist temples are found on Tarai Plain. It is reported, however, that a few Moslems live in villages near the Indian border.

Ratio of tenant cultivators to land owners is larger than in Janakpur. In the case of Dhajjan village where the model agricultural co-operative society is found, 80% of paddy land is cultivated by tenants. Therefore, the size of holding is generally small and the cultivation tends to become more intensive than in Chitwan Valley and Janakpur. Unlike Janakpur, the tenancy contract in this area tends to be concluded for paying of fixed amount of land rent rather than for share-cropping. Jute cultivation is carried out in fertile lands (lands graded class-1 for tax collection; Awal) and about 50% of these lands is owned and cultivated by owner farmers.

Apart from the lack of irrigation facilities, price stabilization of agricultural products is what is most wanted by farmers. Price fluctuation of cereals is quite large, with the selling price sometimes doubling in a matter of year. But in the case of jute which is a cash crop, price fluctuation invites worse damages because peasants are inclined to sell the jute immediately after harvesting.⁹⁾ The situation is aggravated by the fact that even small peasants must resort to employed workers in the jute harvesting season which coincides with the transplanting season of the second crop (paddy). Manual labour for immersing and processing harvested jute to obtain its fibre is very troublesome. In the harvesting season of jute when there is little possibility of asking for the help of neighbouring villagers in return of their later service, farmers unable to pay the wages for daily workers (payment in kind already gave its place to cash payment) are often driven to ask jute brokers for loans. For these reasons, the habit of selling the jute to brokers before harvesting become increasingly prevalent. The selling price of jute at the village market (Hat) is said to be about 40% of that paid by jute factories at Biratnagar, but only half of this price is paid when the brokers buy the unharvested jute. The Mission learned that this habit covers about 20% of total jute production

It will be well understood from the above description that what is most urgently needed by the farmers in this area is a positive measure for establishing a satisfactory marketing system and stabilizing the price of agricultural products (particularly jute). Efforts must also be made for mechanizing the process of separating fibre from harvested jute which is now dependent on manual labour, and for improving the agricultural financing system so that farmers may not be forced to resort to brokers or money-lenders in obtaining their funds for farm management or expenses for marriages and funerals.

The Government measures put in practice this year for fostering agricultural co-operative societies (designation of three model associations and despatch of managers from the Agricultural co-operative Department) is understood to be aimed at meeting the above-mentioned requirements. It is to be regretted that these measures have not yet produced any noticeable effect due to the lack of smooth cooperation and coordination with Government organizations including the Agricultural Development Bank. The Mission noted that the activities of managers despatched by the Government are hampered by the lack of necessary financial back-up. The Mission is of the opinion that the agricultural co-operative movements should be so fostered that they grow with the expansion of the agricultural financing system, whereby the demands for funds by farmers can be fulfilled and the joint sales of jute through agricultural co-operative societies can be promoted.

In Jhapa District, there is only one graduate extension officer (District Agricultural Development Officer) who is not provided even with a jeep which is a must in performing his duties. Extension service in this district is therefore extremely poor. The Mission felt that qualified workers and equipment must be increased in this district to elevate the existing level of extension work at least to that in other districts of Tarai Plain.

NOTES

- 1) Dept. of Publicity, Nepal; Manjitraharuma Ankin, Kathmandu, 1966, p.8.
- 2) Data collected by Panchayat Training Institute, Rampur.
- 3) Cf. Ministry of Defence (UK), Nepal and the Gurkhas, London, 1965.
- 4) B.K. Sinha, Co-operative Development in Nepal, New Delhi, 1965, p.4.
- 5) The following work by Dr. Dhital Presents full explanation with deep insight on agricultural problems caused by fragmented holding of farm land.

B.P. Dhital, Farm Size and Fragmented Holding – an impeding factor in the development of Nepalese agriculture, "Journal of Agriculture" Vol. 3, February 1968, pp. 13 – 32.
- 6) Rice millers in Nepal often run money lending business.
- 7) Ministry of State, Dhanukha Jilla Parichaya, Kathmandu, 1966, p.2.
- 8) Cf. S.B. Dradham & B.P. Bhattarai (Department of Agriculture), Jute Marketing in Nepal, Kathmandu.
- 9) One of the causes of hasty selling is that farmers want money for Dasain.

2. AGRICULTURAL ECONOMY

(1) Chitawan Area

This area is a new ground built by clearing forests and fields under Rapti Valley Multi-purpose Development in the First Five-Year Plan that started in 1956.

Settlers in this newly reclaimed area, mostly from the mountain districts are engaged in the agricultural production. Many of them possess their own land and are enjoying their free production without being bound by their former pattern of life.

There are some among them who try to introduce modern agricultural techniques, though still at the first stage.

As a whole, however, their activity of farm production has been limited to a certain extent because of the deficient stock of funds and the short period elapsed since they settled themselves.

The level of agricultural technics in this area is still low, and even in the wet season, irrigation water cannot be obtained at some parts. The improvement of agricultural technics is not so progressive yet and farmers have just started to introduce modern technics.

In order to raise the agricultural technics higher, it will be necessary first of all for them to secure irrigation water. Farm production will then become very active, followed by the introduction of fertilizers, improved varieties and farming equipments, and intensive farming. At the same time their productivity will be increased.

Improvement of agricultural technics centering on full utilization of irrigation water is expected to bring about substantial production increase. It is to be added, however, that measures should be taken for marketing development, arrangement of marketing system and price stabilization of agricultural products so that the anticipated production increase will lead to the increase of farmers income.

The West-East Highway has already been completed as far as Hetaura, which connects Hetaura, Kathmandu and Birgunj. Because of this helpful route for the transportation of goods, demands for agricultural products in those cities can be met fully.

It is open to question whether the increased yield in this area can find its outlet on favourable price conditions. However, judging from the fact that the Nepalese trade has

been totally dependent on India over the past years, it is certain that domestic markets will serve the purpose of stabilizing prices of agricultural products.

At present, the income of farmers in this area is very small. This is considered ascribable to the low level of farm production and also to the disadvantageous conditions under which farmers are placed in the process of squeezing the income out of agriculture.

The fact is that they seek to raise the productive level, but have no funds for it because their income is so small.

This area has a number of organizations intended for agricultural development. The Agricultural Supply Corporation (ASC) secures the supply of farming materials and equipment for farmers, the Agricultural Development Bank (ADB) offers agricultural credit services, and many agricultural cooperative associations render services to the settlers. But these organizations are not fully utilized. Farmers in general do not or cannot make full utilization of them. It is therefore important to combine these organizations systematically and develop them into farmer's own organs.

a. The Present Condition of Cultivated Land Utilization

The land in this area, as enough water is obtained in the wet season, is used for paddy fields.

As such, paddies are generally planted availing of rainfalls in May and June and harvested in October and November. As a second crop, wheat, mustard and maize are planted and harvested in January and February.

Where water is not sufficient for paddy, maize is planted taking advantage of the wet season, and as a second crop, wheat, mustard and some other crops are planted.

In this area it is possible to raise three crops a year but they raise only two. Moreover, this "two crops" is not practised completely.

Reasons for this are that: only a small part of this area is irrigated even in the wet season, practically no rain water is available in the dry season (November – April), there are no year-round irrigation facilities, and lastly, farmers fail to take measures for maintaining the land productivity despite the heavy loss of soil nutrients.

Farmers cite the sufficient supply of irrigation water as the primary condition for increasing production.

There was a case where irrigation facilities were constructed by the initiative of farmers themselves who furnished with their meager funds. Their want of water is unexpectedly acute.

It is more important than anything else to secure water before the introduction of other agricultural technics in order to make higher utilization of farm land in this area. While great expectations are given to rice as the cash crop, they also have a strong liking for rice. This can be proved by the fact that farmers who do not raise rice buy it with the money they get from other crops.

b. Level of Agricultural Technics

Agricultural technics employed in this area are rather poor. After transplanting with rain water, the only care of fields performed before harvesting are inter-cultivation and weeding. They have just begun to use modern agricultural technics such as chemical fertilizers, improved seeds, agricultural chemicals and improved agricultural machinery.

Fertilizer: they use mainly manure prepared by themselves, but not fully. Chemical fertilizer has recently come into wide use, but the amount applied is still very limited. According to the sales record of ASC Sales Dept in this area from 1967 to 1968, the supplies in elements were 19.03 M.T. of nitrogen, 10.92 M.T. of phosphoric acid, and 5.64 M.T. of potassium.

Agricultural Chemicals: Use of agricultural chemicals has just begun to spread like fertilizers, but only a small amount has been used yet.

Improved Seeds: The improved variety of wheat is more popular than other crops. The results of ASC from 1968 to 1969 show that 30 M.T. was sold.

Total amount distributed during the said period is a little larger than this value since the improved seeds are sold also by merchants having no relations with ASC.

Agricultural Implements: farmers in general use only such small agricultural implements as plough drawn by cattle and hoes for cultivation, and sickles for reaping.

Some are using large tractors and this may be considered a first step of improving agriculture.

Although no calculations were made to check if renting large tractors for cultivation is sufficiently profitable, the mission believes that the renting system of agricultural machinery will become popular in future to save labor force.

The number of family members per household is small and the average acreage of farm land per household ranges from 1.5 to 2.0 ha. which is larger than in other areas. This is the cause of labor shortage in the farming season.

c. Supply of Agricultural Materials

Sales Depot of Agricultural Supply Corporation (ASC) is situated at Bharatpur and it provides the farmers with such agricultural materials as fertilizer, improved seeds, agricultural chemicals, and improved farming machinery.

This Sales Depot was established in the fiscal year 1967–1968. It plays an important part because it is not so long since the farmers settled here and because their farming technics are so poor that there are only few merchants who supply agricultural materials. Hereafter the Depot will play a significant part in providing farmers with agricultural materials at reasonable costs.

*ASC was established according to the 1964 Public Corporation Law of 1966. Since then Branch Offices and Sales Depots have been founded in every district and now Nepal has 6 Branch Offices and 9 Sales Depots.

d. Supply of Agricultural Credit

Farmers who are short of funds cannot purchase easily agricultural materials such as fertilizer and seeds of improved varieties. They have no alternative, but to resort to private financing facilities such as merchants and landowners.

The Branch Office of Agricultural Development Bank (ADB) which lends farmers funds for production is situated at Bharatpur of this area to meet the demand of those farmers.

At present, however, ADB is not yet in the stage of allowing farmers to make full utilization of its services, nor are farmers in a position to be able to utilize ADB. Farmers are hoping for the increased availability of ADB's funds and simplification of procedures. The outstanding loan balance of Bharatpur Branch Office of ADB as of September, 1968, was 260,000 rupees, which was bigger than that of other districts.

*ADB was set up to take over the business and assets of Cooperative Bank which was established in September, 1963. For advancement to farmers, it has Farm Production Fund, Water Supply Fund, Storehouse Construction Fund, Cultivation Fund, and Domestic Industry Fund.

Farm Production Fund is lent to farmers for a short term so that they can get improved seeds, fertilizer, feed, agricultural chemicals, farming machinery, etc.

As for the basic treatments for loans, they let farmers present their farm management plan and after it is screened, ASC generally finances it in kind through Agricultural Cooperative.

Water Supply Fund is lent for a middle or long term loan for purchasing a water pump, digging a well, and minor irrigation.

e. Agricultural Cooperatives

Supply of agricultural material and credits thereof is carried out systematically through agricultural cooperatives.

The first one in Nepal was born at this area subject to Rapti Valley Multi-purpose Development.

Nowadays there accounts 39 Village Panchayat enjoying its agricultural cooperative out of 42 in this area. The average member per cooperative is 47 and the total of cooperatives at work non is 88. According to a government official, all the cooperatives are on the sound wheel, except one which reveals deficit in balance. However, there seem latent plenty of problems, such as shortage of cooperative members, scarce allotment of capital and others obiding with the management.

Originally, these were made up for the goodness of small farmers who would be handicapped in their economical situation, so that they might unit themselves to protect benefets of their own. These, however, turned out to leave the ordinary farmes behind from the true spirit of the cooperative -- mutual assistance, and stumble now in the slow development; because they were born mainly from the recommendations of high quarters.

f. Marketing Status of Agricultural Products

The staple products in this area are rice, maize, wheat and mustard. They are on sale, with the exception of appropriatting some for farmers' own consumption, and, generally speaking, the marketing of agricultural products is in progress.

Almost 90% of the buyers are merchants from Narayanghat and Bharatpur, who make rounds to buy harvest calling at each farmer's.

Those merchants are in the possession of storages and processing factories and sell their processed food to the consumers in this area, Hetaura, Birgunj and Kathmandu.

Some of the collected harvest are not processed here but sent to Hetaura, Birgunj or other places for advanced processing.

Farmers in this area are accustomed to sell most of their products immediately after the harvest, (*1) from the reason that they have seldom other means to get cash-revenue and that they are not favored with storage houses. Merchants, on the other hand, are able to buy from the farmers at the lowest-priced season when the harvest is just gathered, and to wait for the highest-priced season to sell.

According to the information collected so far, the producer's price of paddy is about 27 rupee per mound (37 kg) and soars to 50 rupee, or 80% higher, at the scarce season of April and May; similarly, Maize at the season of September and October is priced at 30 rupee per mound, rising up to 40 rupee in March and April.

The price-differentials will also be said with mustard, the main cash-convertible product of this area. It's producer's price is the lowest 50 rupee at the harvest season of January and February and goes to 65 rupee, or 30% higher, at the least-stocked month. There is considerable price-differentials, in addition to the seasonal changes, between the price of producer and of consumer even in the fact that the consumer's price of mustard oil per mound is as high as 170 – 240 rupee. (*2)

(*1) These are some farmers capable to respond to the price-change. Our survey revealed that some farmers were refraining themselves from selling maize to meet the change.

(*2) Mustard oil is said to be manufactured by the rate of one third from a mound of mustard. Processing cost and other charges must be counted in the price besides the net profit of the manufacturer.

(2) Janakpur Area

Geographically, this area is situated so close to India that it is quite easy to get contact each other. While the road here to Kathmandu, in the same country as it is, demands a long way either by air or full twelve or thirteen hours by driving a hardly manageable rough if in the dry season.

This area, mingled with India from the olden times, is racially of many India origin natives and has a strong Indian colour socially and economically.

Cultivated land utilization here is observed largely in paddy fields and the degree of concentration is comparatively high. Fertilization, particularly, is far advanced than other parts of the Tarai zone.

Farmers are seen diversified in their livelihood. For instance, the rich class has already brought in a somewhat modern agricultural technics, being inspired with the new trends; the ordinary class has no fund to reform his old technics.

The level of their technics is low on the average, so is their productive power. It may be said that their shifting to modern agricultural technics is yet on the initial stage.

The activities of ASC as the medium of material supply could be evaluated pretty high, considering in their wholesome results.

It seems common among farmers to borrow money from private financial sources because A D B is not popular enough to make farmers feel free to ask for. This means farmers are more or less owed financially to private sources.

ADB is, therefore, expected by the farmers to loan the money with appropriate interest and term of expiry.

This area depends heavily upon the agricultural market of India, and the market prices here are used to be affected by the Indian influence.

The agricultural cooperatives in this area are hardly to be called a success yet and even a hint sounds unattractive to be farmers. It will be required to put this peculiarity in mind if the sound management is expected for.

The problem, after all, will be how to adjust and develop their activities to and along the essential purpose of the agricultural cooperatives.

a. The present Condition of Cultivated Land Utilization

Cultivated land utilization of this area is best seen in paddy fields which are planted in the rainy season. There are many tube-wells or ponds in this area to be used for supplementary irrigation and drainage facilities, and, to some extent, for paddy fields at the dry season.

The typical pattern of Cropping is as follows:

Paddy plant in May through June, at the beginning of the rainy season, taking advantage of rainfall; Harvest in October and November; Wheat plant in November through December; Wheat harvest in February and March. In some fields paddy's double plant is taken place, while wheat plant, the second crop, is held at about 30% of the paddy fields.

b. Level of Agricultural Technics

There is seen considerably concentrated cultivation in this area where the land is utilized mostly for paddy fields.

Fertilizer ---supplied in elements by ASC of this area in 1967 through 1968 --- are: 226^{MT} of nitrogen, 123^{MT} of phosphoric acid, and 21^{MT} of potassium. The amount is third best in Nepal. First is Kathmandu with 1,120^{MT} of nitrogen, 356^{MT} of phosphoric acid and 90^{MT} of potassium, and second is Birgunj with 854^{MT} of nitrogen, 245^{MT} of phosphoric acid and 81^{MT} of potassium.

Use of compost is also fairly prevailing. Though fertilizers are getting familiar among the farmers, the amount applied per unit is yet negligible, so is the use of agricultural chemicals.

Farming tools --- as simple as plough drawn by cattle, hoe and sickle. The soil of this area is rather fine in particles and rich in adhesive power, which makes it hard to cultivate, since it turns to mud in the rainy season and gets hardened in the very season. Accordingly, tools appear to be worn out easily.

Modern agricultural machinery has widely been demonstrated at the Hardinus farm of FAO, and some rich farmers are clearly showing their interest to acquire new cultivating equipments. We were noticed occasionally for example, of their demand for those made in Japan, through the talkings with the farm keepers. However, it must be understood that ordinary farmers can hardly renew their small tools.

Improved seeds --- improved seeds of wheat are on diffusion over this area, which must be results of the advanced research of the governmental farms to introduce the better wheat and of their active campaign to spread it.

The actual supply amount of seeds through the hands of ASC, for 1968 and 1969 shows approx. 30^{MT} of paddy and 78^{MT} of wheat. The latter figure ranks highest in Nepal.

The reasons why paddy seeds are less in amount than wheat ones may be ascribable to the following three: first, farmers are making self-supply of paddy seeds; second, many conditions are required to introduce improved rice breeding; third, farmers' appraisal for the improved breeding is still low.

c. Supply of Agricultural Materials

There are a branch office and a sales depot of ASC in this area, for which farmers seem to be showing firm expectations.

ASC, in reply to their reliance, must be working for the benefits of farmers.

One of the standing problems for ASC is transportations. *Traffic troubles, particularly of agricultural paths, are imminent in this area. These may be excusable if in the dry season but become much worse in the rainy season.

These roads, uneven and zigzagging, bother not only in-coming of production material but out-going of agricultural products.

*Agricultural material to be supplied through ASC are usually sent from the manufacturing countries, say, India, Japan and West Germany, to Calcutta by ship, and from there to the boulder of India by rail, and finally from there to this area by vehicles. Transportation, therefore, charges a big burden on this area, probably similar to the other areas.

d. Supply of Agricultural Credits.

Loan sources to be relied in this area are: (1) between relatives (2) landowners and usurers within the same village (3) merchants (4) agricultural cooperatives (including ADB loans).

ADB has not been utilized by ordinary farmers so much excepting a few diligent farmers. They are, however, eager to get new agricultural material, so are they inclined to utilize ADB, provided with appropriate interest and term, rather than private financial sources.

e. Agricultural Cooperatives

A number of agricultural cooperatives have already been founded in this area, but there are seen rather few that succeeded in penetrating among the farmers with their original purposes, that is to say, to protect rights of the small farmers by the goodness of mutual assistance. This area seems to be the best theater for an agricultural cooperative to display her full activities, whereas farmers' impression toward her is not so friendly.

Some of them taken for worst cases, are even despising her as a mere source of subsidy. These are in all 65 cooperatives set up at the Dhanukha district of Janakpur, but those under operation, during our survey period, are counted only three ---- Centre Janakpur, Raudia and Ghorghas.

We visited Raudia, as her agricultural cooperative is said a model to others, but found here nothing like the one we had expected. No permanent facilities were seen here and none but one governmental official was posted.

The principal activities of this cooperative are, as we saw, sales of agricultural material and loans for the farmers' sake. These are not enough to make her run utmost, so should be expected to foster an agricultural cooperative in a true sense.

f. Marketing Status of Agricultural Products

Agricultural products are mainly sold out in no delay after harvest, as same as in other areas. Pastoral scenes. ---- drawing carts full of crops, one after another, on the roads to Janakpur ---- are familiar to visitors at the harvest season.

The dealers of these products are mostly India-originated merchants who have now Nepal nationality. Some of them are rich enough to possess storages or factories for processing. To some extent they manage to control market-prices and sell their stock or processed goods to local consumer's markets, but by and large to India, the greater land of consumers.

Characteristically, there are just a few rice-polishers in the city of Janakpur, who are sharing markets with their large-scale processing factories. There are some more in the village level, who run rice-polishing business in a small scale.

Trade with India is important here, since the traffic routes to connect around the Tarai zone have not yet been secured. Market-prices in India, accordingly, affect immediately on the prices in this area; Initiatives to fix prices here are in the hands of India.

The East-to-West Highway connecting Simra with Janakpur is now under construction backed by the U.S.S.R., which, on completion, will favor this area with the wider demand zone within the country, in addition to India.

It is observed that annual producers' prices for each crop are fairly flexible. Some of the circulated prices of recent are: paddy in August and September values at 45

rupee per mount and drops in November and December around the harvest season, into 25 rupee; wheat is 60 rupee per mount in October and November and downed to 40 rupee in March and April, around the harvest time; maize is 36 rupee around the harvesting September and October and rises to 45 rupee in March and April.

The richer farmers are able to sell their products at the highest-priced season, taking advantage of the shifting of producer's prices, while ordinary farmers are generally obliged to sell at the cheapest-priced season immediately after the harvest.

3. IRRIGATION

Nepal is favoured with the richest water resources in the world as the entire country lies with the vast extension of the Himalayas at the back. Nevertheless, farmers in this country are invariably in want of water, whether they cultivate paddy fields in the extensive Tarai Plain or the astonishing terrace fields in the mountainous district which reflect the accumulation of their past labour. During the survey trip, the Mission encountered many farmers who asserted that they needed only water for future improvement of farming. This acute want of irrigation water was also expressed by Mr. Teruo Shimada, a Colombo Plan expert who settled himself in Chitwan Valley and is engaged in guidance activities for Nepalese farmers.

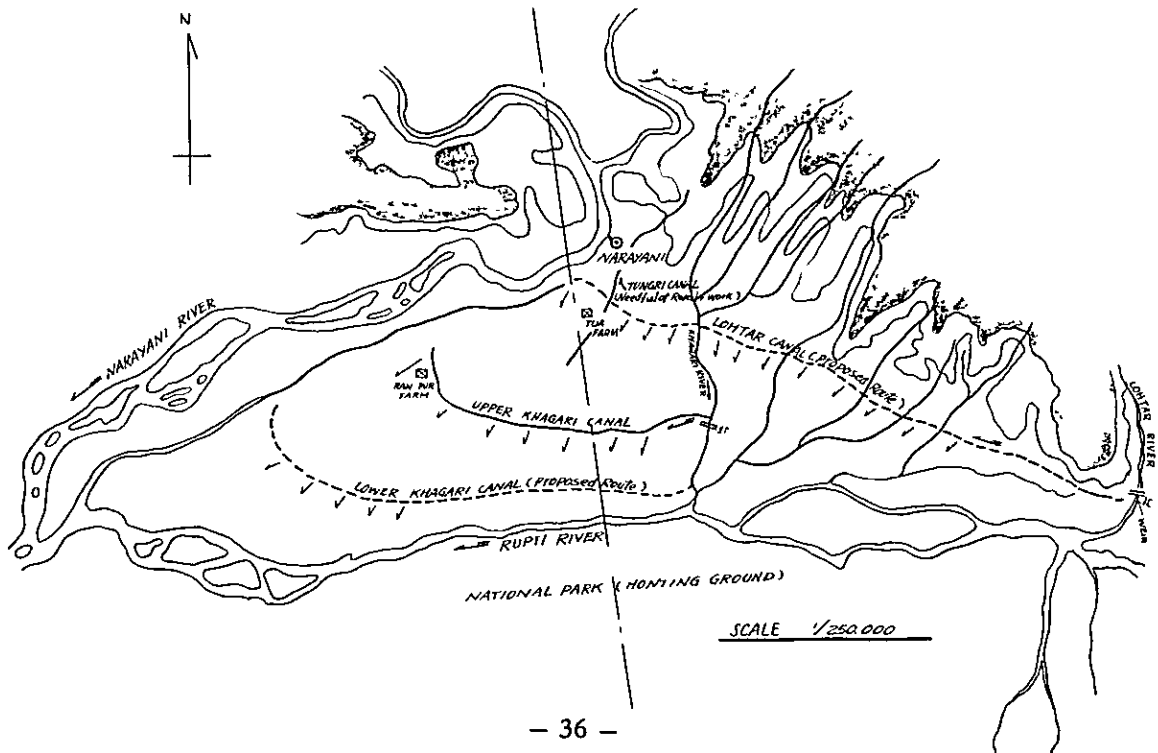
Does it entail many difficulties to obtain sufficient irrigation water in Nepal?

The answer to this question is that the Mission was convinced that no more than one third of the investment required in Japan would be demanded for successful irrigation work in Nepal, though the present survey covered only a part of eastern Nepal.

Development of irrigation must be preceded by close survey of topography, river discharge, underground water, soils and farming conditions, and should be so planned that it will be compatible with the local conditions of each district.

In Nepal, natural conditions are so diversified that it is impossible to draw up a plan or measure that can be indiscriminately applied for irrigation development. Irrigation development in Nepal should therefore be planned with due considerations give to the difference in local conditions.

*Fig 1 - SKETCH OF IRRIGATION CANALS
IN CHITWAN (RAPTI) VALLEY*



(1) Chitwan Valley Area

As shown in Fig. 1, Chitwan Valley in Narayani Zone is an area of about 32,800 ha encircled by the Narayani river and the Rapti river.

Since 1956, the United States has been extending cooperation to Nepal in the Reclamation and Settlement Project of Chitwan Valley, and completed the settlement plan in 1961.

In concert with this development, the Nepalese Government established the Rampur farm at the centre of the valley for researches on cereals and extension of improved varieties. The Government also constructed the Upper Khagari Canal with a headwork built in the upper reach of the Khagari river, whereby the central district of the valley was provided with irrigation water and its agricultural production made a large increase.

In addition, an experimental farm intended for researches and extension of horticulture was established by voluntary workers of the Tokyo University of Agriculture under the leadership of Mr. Shimada who has been devoting himself since 1963 to the agricultural development in Nepal. Over the past years, this TUA experimental farm has worked in cooperation with the adjoining Government Narayani Horticulture Farm in the agricultural extension service, and at present, it is frequently requested by farmers in its neighbourhood to provide them with technical guidance and information. Activities of the TUA experimental farm are now highly evaluated not only by local farmers but by the Central Government as well. However, since the farm is situated on the top-most river-side terrace of the Narayani river, its activities are hampered by the shortage of irrigation water.

Shortage of irrigation water suffered by the TUA experimental farm is a problem that prevails in the entire upper district of Chitwan Valley. Water pumped up from the higher underground water level amply satisfies the drinking purpose, but is never sufficient for irrigation.

The United States has one extension worker stationed in the valley who is actively working for settlers in Chitwan Valley, but the area he covers is just too wide for one worker. Further, settlers are forced to resort to the dry farming method because there are no irrigation facilities in the valley except in the central district. Thus, satisfactory extension work in the valley is made quite difficult.

The first phase development of Chitwan Valley may be considered to be complete because the settlers have already cleared forests and settled themselves. But the second phase development which should ensue the settlement of farmers is not in smooth

progress. The first phase development was aimed at clearing forests, whereas the second phase development is intended for farmers and farming and no one can guarantee that its stalemate will not develop serious social problems. The Mission is therefore of the opinion that utmost importance should be attached to the promotion of the second phase development.

a. Development of Irrigation in Chitwan Valley

The basic plan for developing irrigation in Chitwan Valley has already been formulated, envisaging the construction of the following three main canals for surface water irrigation of a total of 32,800 ha.

Lohtar Canal	Gross Commanded Area –	40,000 AC
Upper Khagari Canal (Existing)	”	– 25,000 AC
Lower Khagari Canal	”	– 17,000 AC
TOTAL		82,000 AC (32,800 ha)

As shown in Fig. 1, the proposed route of the Lohtar Canal runs from east to west crossing many brooks that flow down the northern slope piedmont with its water source planned to be secured by the construction of a headwork on the Lohtar river. When the Mission inspected the site of headwork around the end of March, the river had a discharge of about 3 m³/sec. This points to the possibility of water supply during the wet season, and further suggests that the cultivation of about a 10,000 AC paddy field will become possible even in the dry season if proper water management is conducted.

Reconnaissance of the route of this canal is now in progress by two Pakistani irrigation engineers. It is expected that a period of about 18 months will be required to complete a working design of facilities for the irrigation system of about 11,000 ha to be covered by the Lohtar river. Approximate estimate of cost for implementing the irrigation plan, inclusive of the construction cost of the headwork and main canals is as given below.

In case main and branch canals are earth lined	\$5,500 thousand
In case main canal alone is concrete lined	\$7,500 thousand
In case of a complete irrigation plan including water management and field readjustment and levelling	\$13,000 thousand

The Upper Kharagi Canal, whose construction was initiated in 1961 and completed in 1966, excels in both planning and construction from the viewpoint of civil engineering techniques. Original irrigation plan by this canal was intended for the supply of water to paddy fields in the wet season in the gross commanded area of 25,000 AC. However, actual irrigated area in the 1968 – 1969 period was 8,000 AC, showing the need for further improvement in water management techniques. In 1967, the Government decided to collect a water charge of 6.50 Rs/Bigha from the beneficiary farmers, but this decision has not yet been put in force. After completing inspection of the Upper Khagari Canal and its commanded area, the Mission felt much concern about the possibility of extending technical cooperation centering on the water management and extension service.

The Lower Khagari Canal cannot be planned for year-round irrigation because the water of the Khagari river is drawn into the Upper Khagari Canal in the upper reach. However, water supply to its commanded area will naturally be taken into account when the Lohtar Canal is constructed. In the commanded area of this canal, pumped irrigation using underground water is considered most suitable for topographical reasons. Survey of underground water in the planned irrigation district should therefore be undertaken at the earliest possible time.

The already existing Jungri Canal was constructed in 1961 by the efforts of local agricultural leaders at a cost of approximately 147,000 Rs to make use of ravine water in the north for water supply to paddy fields in the wet season. However, since its water source was deficient and its upstream section which passes through a hilly slope was broken by heavy rains during wet seasons, the canal has not been in use for the past six years. Field survey revealed that a cost of about 600 – 800 thousand Rs would be incurred for restoring it to serviceable state and securing sufficient water sources.

b. Establishment of Water Management

The primary requirement in the development of Chitwan Valley is the supply of sufficient quantities of irrigation water.

The next important thing is to establish the water management techniques and provide farmers with guidance on a cropping pattern compatible with such techniques. Successful progress of the second phase development plan of Chitwan Valley would never be possible without the development of a project of suitable scale (500 – 100 AC) through which necessary technical guidance to farmers could be provided. For this purpose, either one of the following four schemes may be selected.

(a) Improvement of the Jungri Canal and construction work to secure its water source.

This scheme aims at construction of the canal for 1.5 km in the upper reaches and construction of a diversion weir on a tributary to secure water source.
Irrigation area: about 1,500 AC.

(b) Pumping up the water of the Narayani river

This scheme envisages installation of a pumping station at Narayani Bazar to lead the water of the Narayani river into the Jungri Canal through a pipe line, and execution of necessary improvement of the canal downstream of the intake.

Fig 2 Section A-A'

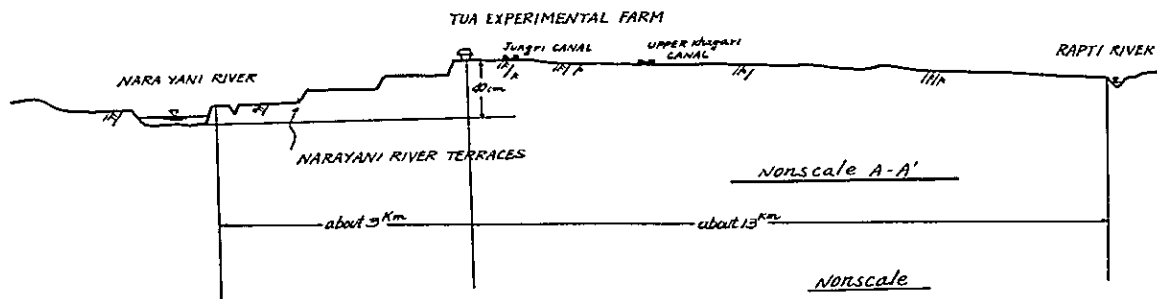
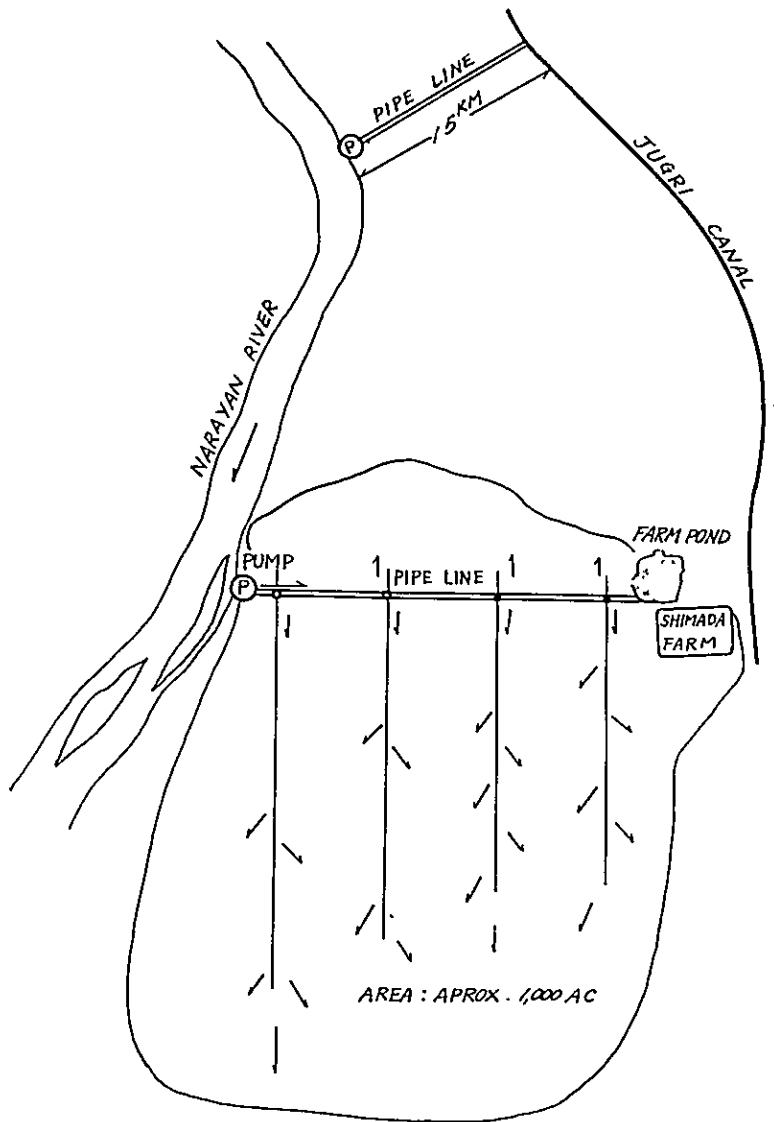


Fig 3 - OUTLINE OF PUMPED IRRIGATION FROM NARAYANI RIVER



(c) Pumped irrigation from the Narayani river

The bank of the Narayani shown in Fig. 3 offers an excellent site for installing a pumping station. This scheme is aimed at connecting this pumping station and the Shimada farm with a straight pipe line for irrigation of the downstream area of about 1,000 AC. As the terrace fields in the planned irrigation district are fertile, the farming guidance activities will be much facilitated. If a new farm pond is provided, guidance for water management could be given in an ideal way.

(d) Pumped Irrigation using underground water in the vicinity of the Lower Khagari Canal.

The first step needed for this scheme is the test boring to clarify the underground water level and availability of water.

All the above four schemes are practicable, but priority should be given to one of them by conducting feasibility study for which a period of about 45 days would be required.

(2) Janakpur Area

The area surveyed in Janakpur Zone is a part of the so-called Tarai which is surrounded by the West-East Highway running through the countries of Salahi, Mahottari and Danusa and by the border line with India. Survey activities in this area were impeded by the extremely poor conditions of roads of silty soil. Lying with mountains extending in the north, the area was covered with forests on either side of the West-East Highway, and only few settlers were found.

The Nepalese Government is anxious about utilizing the water of the Kamala river which flows north to south in the eastern part of Danusa country, and the necessary reconnaissance has already been completed by Nihon Koei. However, the cost for the desired water resources development, including construction of dam and other facilities, is expected to amount to a huge sum. Materialization of this project appears to require many more years.

Irrigation water that cannot be dispensed with for the development of this area can be obtained by pumping up underground water. There already exist many artesian wells (wells used by farmers measure 1.5 inches in diameter and their durable periods from 4 to 5 years). It may be added that a tube well is the major source of water supply at the 103 AC pilot farm which was established by FAO (contractor: Nihon Koei) at Hardinath in Danusa country and which is engaged in experimental work since May 1969.

a. Achievements of Hardinath Pilot Farm, and Conditions in Its Neighbourhood

At the Hardinath Pilot Farm located about 8 km to the north of Janakpur City, test boring of a 120 m tube well (12 inch dia. in the upper layers and 8 inch dia. in the lower layers) was conducted with successful results. At present, the tube well supplies 2,500 tons of water per day. The boring work of this artificial spring took about 20 days, and at the outset, the spring jetted out about 400 m³ of sand and gravel, though the shooting up is completely subdued at present.

Incited by this success, FAO is now conducting boring work at seven places in the neighbourhood in an attempt to obtain irrigation water from the wells of the same size. Data of these boring works, now being arranged by Nihon Koei, indicate that wells closer to mountains are smaller in head but provide a larger amount of water, whereas those closer to the border line have a larger head (7 – 10 m) but have smaller water quantity.

Farmers in this area pay about 2 Rs/ft to Indian contractors for digging wells of about 1.5 inch dia. Their success probability, however, is about 50% due to the primitive boring method employed.

b. Comments on Irrigation by Tube Wells

Any tube wells having the depth and size equivalent to those of FAO's wells (more than 120 m and 8 inches respectively) will not fail to provide water so long as they are bored within the area. However, the cooperation of geological experts must be sought to select suitable boring points. In this connection, when the data of the FAO's boring work are compiled and made available, they will certainly be very useful.

From an economical point of view, it would be profitable to dig a well of about 120 – 180 m deep, equipped with a strainer in aquifer.

Boring work should preferably be conducted at points where a water supply of 30 – 50 lit/sec can be expected.

Cost for drilling one tube well, including cost for labour, materials (pipe, screen; and if required, pump and engine), depreciation, etc., is about 15,000 dollars in the case of FAO's Hardinath pilot farm.

Unit water requirement is estimated at 80 AC/cfs (120 AC/cfs for supply to paddy fields in the wet season). Therefore, if water supply of 30 lit/sec per well is assured and the cropping pattern is improved for cultivation of maize and wheat in the dry season, the unit investment cost in irrigation would be about \$400/ha.

In this area, irrigation by underground water is far more advantageous than the surface water irrigation because the period required for boring one tube well is less than a month.

Tarai district is favoured with the richest underground water resources, and there are no plausible reasons for leaving these abundant resources intact.

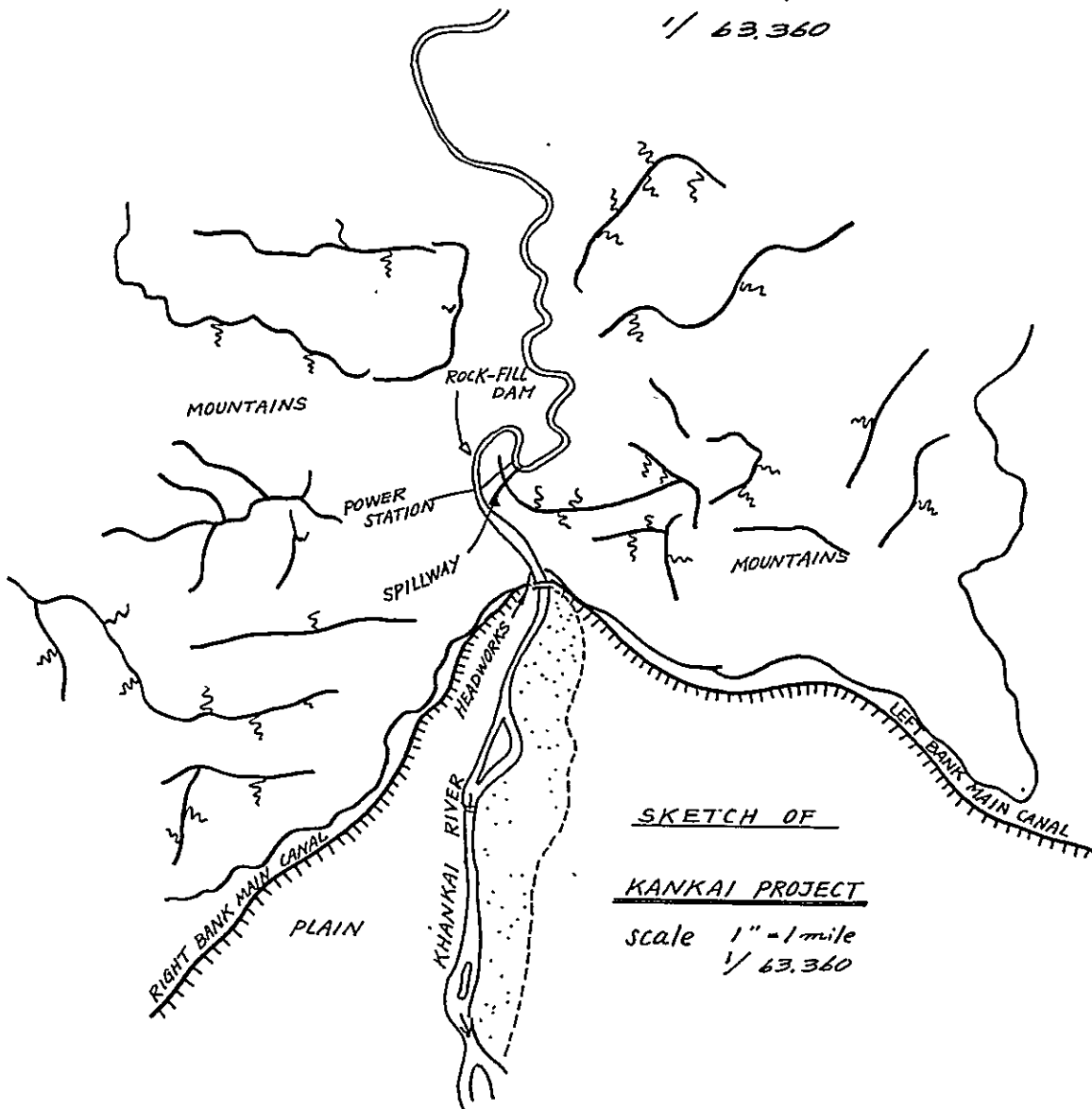
Inspection in Janakpur Area impressed the Mission with the importance of developing underground water resources.

(3) Khankai Area

The Khankai River Water Resources Development Project is in the stage of basic survey which is conducted by Nihon Koei under a technical consultant contract concluded with the Department of Power of the Nepalese Ministry of Water and Power. Nihon Koei is currently engaged in surveying, boring and other field works.

Fig 4 SKETCH OF KANKAI PROJECT

Scale 1" = 1 mile
1/63,360



SKETCH OF
KANKAI PROJECT
scale 1" = 1 mile
1/63,360

Kankai River

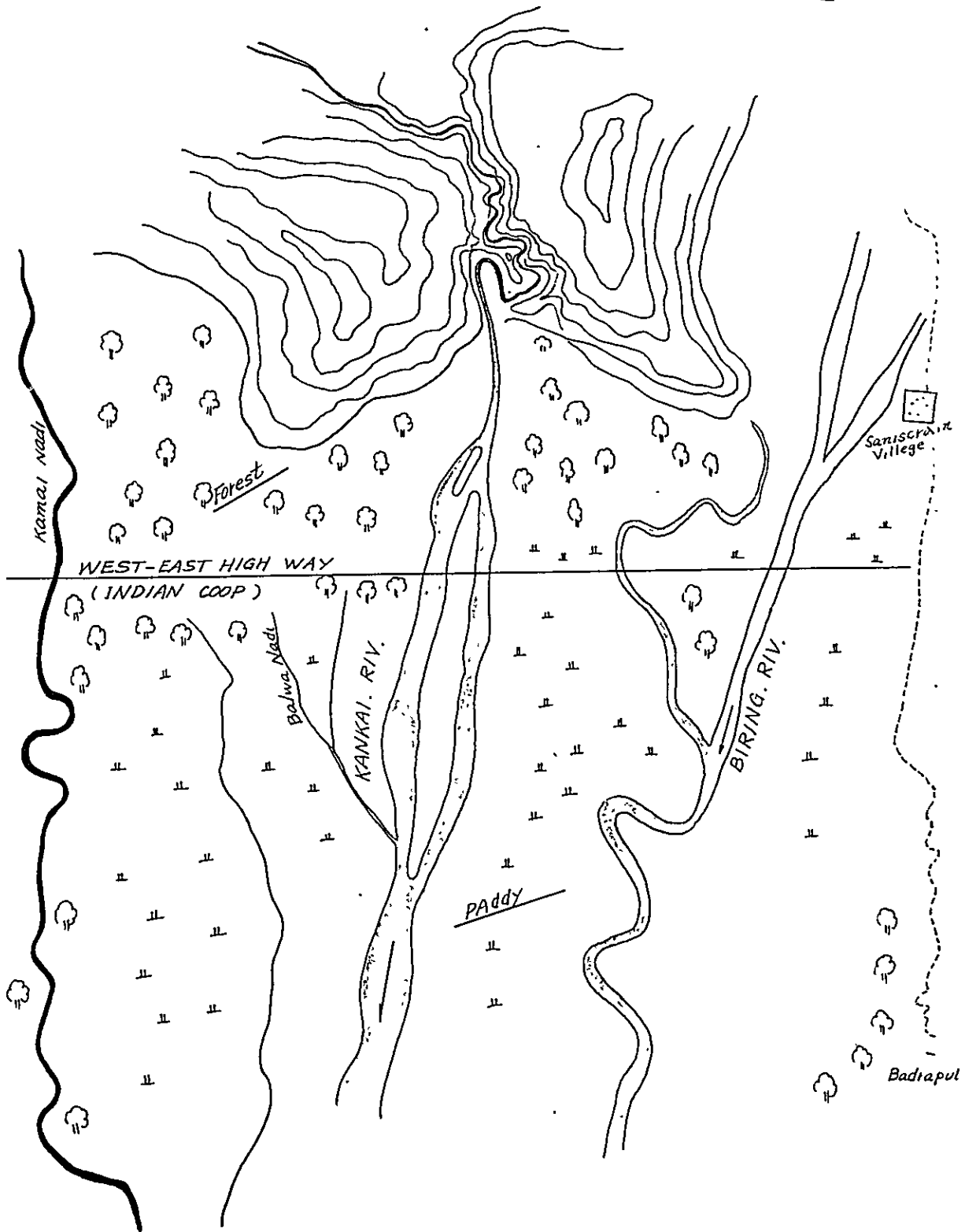
River width at dam site : Approx. 110 m
 " " " headworks : " 250 m
 Man. flood discharge : " 6,000 c/sec
 Droughty discharge : 5 c/sec

The Kankai Project covers an area close to the mountains in Jhapa District in Mechi Zone which extends in the eastern end of Nepal.

The economic and administrative centre of Jhapa District is Bhadrapur which maintains communications with Kathmandu by three regular flight services a week.

The Mission carried out a basic survey of the Kankai Project for a total of seven days at the request of the Nepalese Government, with the entire mission members grouped into two parties.

Fig 5 - SKETCH OF KHANKAI IRRIGATION DISTRICT



a. Survey Procedure

Activities undertaken by the Department of Power are limited to the survey at the dam site (for preparation of a map at scale 1/1,000, contour 2m), preparation of a map of the reservoir area (scale 1/20,000, contour 5 m) and boring work (about 20 places, totalling approx. 600 m in extension). Thus, the work now in progress is still in the stage of reconnaissance.

The survey of the proposed irrigation district is also limited to the sounding using a topographical map (1" = 1 mile). Aerial mapping was planned to be performed during the March – April period of this year, but was postponed to the November – December period because of unfavourable meteorologic conditions (excessive wind velocity, in particular) which did not allow the flight of the FAO's light aeroplane at a high altitude of 6,000 m. Sight distance during the March – April period is limited to 3 km even on the level ground due to the dust wind blowing from India, and in no way allows for an aerial mapping. Further, the advent of monsoon season in mid-May cuts off all communications with outer areas. Survey activities are therefore impossible until the monsoon season is over.

Judging from these adverse conditions, the reconnaissance survey now in progress under the technical guidance of Nihon Koei would require at least one more year before completion. And if the reconnaissance is to be ensued immediately by the preparation of the feasibility report, another year period would be required. Further, since the appraisal of the project by the Asian Development Bank before granting the loan is made on the basis of the feasibility report, commencement of actual construction would be protracted if detailed working design is demanded to be drawn up.

Japan's full-scale cooperation in the agricultural development of this area before irrigation water is secured would therefore be premature, if such cooperation is intended for regional development.

b. Outline of the Project

As shown in Fig. 4, the dam site is located about 1 km upstream of a point where the Siwaliks mountains protrude into Tarai Plain. The selected site is ideal for dam construction, and assures a storage area of 30 km² and an excellent dam efficiency.

The dam is planned to be of the rock-fill type having a total volume of about 1.8 million m³ and a height of about 65 m. No difficulties are expected in obtaining earth materials for the core.

The dam is a multipurpose one intended for flood control, power generation and irrigation. The expected power output is 25,000 kW.

The maximum flood discharge estimated from the past records is about 6,000 m³/sec, while the normal droughty water-discharge is 5 m³/sec which is observed during the middle and latter parts of April. The scale of power generation is planned to be determined after surveying the power demand. The discharge regulated by the dam is expected to be 40 m³/sec which amply meets the irrigation purpose.

The project makes it possible to envisage a total irrigation area of about 40,000 ha, with the intake discharge of the Right Bank Canal and the Left Bank Canal assumed to be 25 m³/sec and 15 m³/sec, respectively. If the main canals are constructed along the predetermined contour line, it would be possible to cover a gross area of 60,000 ha, with the water surface slope held at 1/8,000. It can therefore be reasonably expected that the irrigable district would cover an area of 40,000 ha.

c. Outline of the Planned Irrigation District

Forests covering the upstream area of the Right Bank Canal are partly cleared by squatters. The area extending on the northern side of the West-East Highway is almost untouched, whereas settlers are rapidly increasing on the southern side of the Highway. These settlers are clearing forests freely in the absence of a land reform plan. Since their reckless and wilful behaviour is certain to adversely affect the future development of the area, the Government is urged to take immediate measures for their guidance.

The Right Bank Canal can embrace an area extending to the Kamai river. The development potential of this area is exceedingly high.

In contrast with the favourable conditions of the area covered by the Right Bank Canal, the Left Bank Canal is subjected, as shown in Fig. 5, to the influences of the Biring river which flows parallel to the Kankai river with a distance of about 3 – 5 km apart from it, changing its course each year. The Kankai river does not contain much silt when it reaches the headwork because most of the silt carried from upstream area is sedimented just behind the outlet into the plain. The Biring, however, carries lots of silt into the plain, causing its basin to be inundated at time of flood. Irrigation using the Left Bank Canal inevitably calls for the alignment and control of the Biring River.

The Mission inspected the villages of Sanishare, Budhbari, Dhaijan, Durabali and others which are scattered between the Biring river and the Mechi river, the eastern border line with India. Although irrigation facilities of appreciable scale were not found in any of these villages, the Mission noted that some paddy fields are irrigated with

water drawn through irrigation ditches from dammedup brooks. It was noticed that water supply to paddy fields cannot be neglected even in the Kharif period because of sandy loamy soils, and farmers in all villages are in acute need of irrigation water. Brooks along these villages, when emerging from mountainous district into plane land, generally flow beneath the deposition of stones and gravel, showing little surface water. A farmer who settled himself in the Dhaijan village 20 years ago and is now cultivating a field of 40 acre remarked to the Mission: "I could double the output if only irrigation water were available because the land is very fertile here. I asked the Government for minor irrigation works but received no reply. I'm ready to pay a maximum water charge of 50 Rs/AC if the Government constructs facilities that assure the supply of sufficient irrigation water. I'm convinced I can persuade my villagers to pay the water charge if the Government promises the supply of irrigation water."

The Mission judged it technical feasible to provide these farmers with irrigation water by minor irrigation schemes.

4. Rough Estimate of Construction Cost

Dam	\$20,000,000
Power station and transmission line	\$5,000,000
Irrigation facilities	\$46,000,000

The above estimate was made by Engineer Ichinomiya of Nihon Koei who remarked that the economic feasibility of the project cannot be guaranteed if the overall cost exceeds 60 million dollars. In the event where the project cost exceeds this amount, it would be necessary to introduce the intensive farming method to elevate the productivity of land.

Approximately 60 million dollars (about \$1,000/ha) is estimated to be incurred by the construction of headworks, concrete main canals and their facilities and structures. It is not possible, therefore, to cover the expenses for constructing irrigation facilities of the secondary canals and terminal irrigation facilities within the estimated limit of cost. Further, application of water management techniques which are indispensable for maintaining soil conditions would demand an investment of \$150 - 200/ha.

4. CULTIVATION

(1) Chitwan Valley Area

a. Brief Description of the Area

1) Location

The Narayani river flows from northeast to southwest in this area. Along the eastern bank of the Narayani, there are three terraces extending with a gentle rolling grade. The lowermost terrace embraces a few forests and small marshes. The uppermost terrace, which covers quite a wide area, can be divided into two districts, i.e., the extensive cultivated land where virtually no trees are found and the wide jungle area with sparse forests where reclamation is in progress by settlers. In between these two terraces, there is a substantially wide middle-level terrace where very few forests are observed. The greater part of this middle-level terrace area is cultivated by settlers. Spring water is available at many points along the faults of the terraces even in the dry season, but its volume is extremely small.

2) Soil

The soil texture of each terrace is either loam or sandy loam. The organic content of the soil, which is rather small in all three terraces, increases in the direction of lower terraces. In all three terraces, sand is increasingly observed beneath a depth of about 1 m from the surface soil, with gravelly series underlying it at a depth of several meters from the ground. The surface soil contains somewhat larger humus than the subsoil.

The soil class is fine grains of medium consistency presenting light greyish brown colour, and does not appear to be provided with a large water holding capacity. Neither porosity nor maximum water capacity of the soil is noticeably high. The soil acidity at various points in the area differs by a minor margin, but generally shows the faint or weak acidity with PH value ranging from 5.45 to 6.40. The acidity is larger in upper layers.¹⁾

Deficiency of boron and other micronutrients is recently reported to be observed in the soil of this area.

3) Climate

The climate of the area is subtropical. At the observation station located near the area (i.e., Butwal), the monthly average value of atmospheric temperature ranges from 17.9°C (January) to 31.5°C (May), and the annual average temperature is 25.8°C. Temperature is thus high throughout the year. Annual precipitation at Butwal amounts to as large as 2,632.4 mm, but there exists a sharp discrepancy between the wet and dry seasons. The precipitation during the wet season (June to November) is 2,489.3 mm (94.6%), whereas that in the dry season (December to May) is only 143.1 mm (5.4%)²⁾.

According to the staff of the TUA Rupti Experimental Farm, the temperature difference between day and night is relatively large in Chitwan Valley Area which is rather mountainous and located to the north of Butwal. The same staff stated to the Mission that the monthly average temperature in Chitwan Valley is lightly lower than in other areas.

Table 1. Atmospheric Temperature and Precipitation at Butwal³⁾

Item	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Monthly Average Temperature (°C)	31.1	28.8	28.6	28.3	26.3	22.5	18.9	17.9	20.8	24.9
Seasonal Average Temperature (°C)	Average of wet season (June – Nov.): 27.6						Average of dry season (Dec. – May): 23.9			
Monthly Precipitation (mm)	444.2	743.5	940.6	296.8	47.7	16.5	3.5	18.8	16.2	17.3
Seasonal Precipitation (mm)	Total wet season precipitation: 2,489.3 (94.6%)						Total dry season precipitation: 143.1 (5.4%)			
	Apr	May								
	29.4	31.5	(Annual Average) 25.8							
	28.5	58.8	(Annual Total) 2,632.4							

b. Outline of Existing State of Farm Management (obtained through interviews and from existing data³⁾)

1) Scale and Type

The average area of cultivated land per farm household in Chitwan Valley Area is larger than in other areas. Farmers who settled themselves many years ago usually have a larger cultivated land and many of them employ agricultural labourers besides resorting to the family labour.

Farmers who can secure the supply of irrigation water during the wet season mostly cultivate paddy rice, whereas those who cannot obtain sufficient water engage in the upland cropping centering on the cultivation of maize. In other words, the cropping pattern varies by the availability of irrigation water and farmers give preference to paddy rice cultivation over others.

During the dry season, wheat and mustard are raised for second cropping, but a considerable portion of arable land is left idle due to the shortage of soil moisture. Recently, cultivation of mustard is on the decline and wheat is taking its place.

Besides the afore-mentioned crops, sugar cane is increasingly cultivated throughout the year. Mungbeans and potato are also cultivated though on a limited scale, but forage crops and green manure are hardly raised.

There are signs of increased production of vegetables and fruits such as raddish, onion, water melon and so forth, but the demand for them is still so small that their importance in farm management is almost negligible.

Because of the difference in religion, caste and custom, farmers raise different kinds and numbers of livestock and poultry. However, older settlers usually keep larger numbers of domestic animals of more diversified kinds than new settlers.

Table 2 Scale of Farm Management and Planted Acreage of Old and New Settlers (revealed by interviews with respective farmers)

a) Planted Acreage by Crops (ha)

	<u>Paddy Rice</u>	<u>Maize</u>	<u>Mustard</u>	<u>Water Melon</u>	<u>Mungbean</u>	<u>Sugar Cane</u>	<u>Remarks</u>
Old Settler	16	3	2.5	—	—	—	Wheat is not cultivated. Water melon and sugar cane are new crops in this area.
New Settler	—	5	4	0.15	0.15	0.05	

b) Family and Farming Labour

	<u>No. of Family Members</u>			<u>No. of Family Members Engaged in Farming</u>			<u>No. of Employees</u>
	M	F	Total	M	F	Total	
Old Settler	9	11	20	4	8	12	4 live-in farm labourers
New Settler	6	1	7	1	1	2	1 temporary employee

Remarks for Old Settler: 4 families are living within the same household. The farm labourers are living with the 4 families in the same residential lot.

Remarks for New Settler: Temporary workers are employed to cover the work approximately equivalent to 1-year labour of a farm labourer.

c) Number of Livestock and Poultry

	(Cattle)			(Buffalo)			<u>Goat</u>	<u>Poultry</u>	<u>Duck</u>
	<u>Bull</u>	<u>Cow</u>	<u>Total</u>	<u>M</u>	<u>F</u>	<u>Total</u>			
Old Settler	12	25	37	6	4 (1)	10	15	20 – 25	6
New Settler	–	–	–	2	2	4	–	–	–

Remarks for Old Settler: Bulls are used for farming and transport purposes. Figure in parentheses (1) indicates that one cow is for milking.

Remarks for New Settler: Number and kind of livestock are limited due to the shortage of funds. Poultry is not kept for reason of the custom of the tribe to which this family belongs.

- Note
- * The new farm household is in the second year of settlement, and engaged in upland cropping due to the non-availability of irrigation water.
 - * The older farm household obtains irrigation water only in the wet season.
 - * Both farm households expressed keep desire for irrigation facilities.
 - * Both households hoped for introduction of wheat.

2) Existing State of Cultivation Techniques

—Traditional Cultivation Method as Revealed by Interviews—

Paddy Rice

* Varieties: Domestic varieties are predominant, but planting of such foreign varieties as IR5, IR8, Marindja and Taichung is on the increase.

* Sowing: Speed rice is sowed in the rice nurseries during the period from the latter part of May towards the end of June. With occasional exceptions where manure is supplied about one month prior to sowing, nurseries are not fertilized for sowing. Seed rice is subjected to wind selection using a winnow. About 40 lit/ha (17.7 kg/ha) of seed is sowed in the dry parts of the nursery which occupies about 1/40 of the total paddy field area.

* Spacing: Spacing to transplant is about 16 cm in low lying lands with abundant water supply, and about 10 cm in tablelands where water supply is limited. Square planting is generally adopted, but the row spacing is irregular.

* Seedling Number per Hill: 2 – 4 in both low lying fields and tablelands.

* Care of Fields: Water is drained once in 3 – 4 days after transplanting if drainage can be performed with ease. In case of submerged fields, their surface is dried from time to time. Weeding is conducted by stirring the surface soil in 15 – 30 days after transplanting. Some farmers are aware of the necessity of pest control, but they lack the knowledge of damages and agricultural chemicals and are short of necessary funds. Pest control is therefore performed only by few of them. Drainage is performed in early October when the spikes start drooping.

* Harvesting: Early maturing varieties are harvested in early November and others in the period from mid-November to mid-December. Government statistics indicate that the average yield in this area is 2.5 t/ha. However, the farmers interviewed by the Mission stated that the yield is 1.74 t/ha in high yielding fields and 0.67 t/ha in low yielding fields. The Mission also learned that the yield by headless cultivation of large planted areas is small, whereas small planted areas lead to intensive cultivation which often produces a yield surpassing the values given in the Government statistics.

Maize

* Varieties: Local varieties of Flint corn are predominant. Newly introduced varieties are also cultivated but their ratio is exceedingly low. Local varieties are all hybrids and discriminated by their maturing season. The term "early maturing" or "late maturing" is employed as the name of respective varieties. Since corns are sold at the same selling price irrespective of their variety, farmers cultivate Dent corns for sales and Flint corns for their domestic consumption.

* Sowing: Manure is usually applied before sowing, but there are cases where no manure is applied. Amount of manure was not clarified. The sowing period is from mid-April to mid-May for maize harvested before cultivation of the late maturing paddy rice, and from mid-May to mid-June for maize raised as upland summer crop. The rate of seeding is 20.8 – 25.7 kg/ha. Drilling is not performed, and the spacing is set at about 47 – 52 cm by thinning. The row spacing is not regular. Replanting to cover the lacking seedlings is not carried out.

* Care of Fields: Cultivation and weeding are conducted once or twice using an animal plow and then with a hoe, with the thinning performed simultaneously. The bullock plow and the hoe are primarily intended for cultivation, but are also used for listing. Insect pest is observed to be causing considerable damages, but no agricultural chemicals are sprayed.

* Harvesting: Harvesting period lasts from mid-August to mid-September. Number of spikes per hill is one, with rare exceptions where three spikes are obtained from one hill.

* Threshing: Harvested corn is threshed by hand or by beating cloth bags in which corn spikes are put. Where harvested corn is not immediately sold or needed for food, unthreshed corn spikes are stored on a bed provided 1 m or more beneath the floor until they are to be sold or needed for food.

Wheat

* Varieties: Cultivation of Mexican varieties introduced through India is rapidly extending because of their high yield. Of these introduced varieties, S227 displays an excellent growth and yield, but its cultivation is not extending satisfactorily. Varieties such as Lerma Rojo and Sonora which are widely raised in this area are often found in mixed cropping.

* Sowing: 60 – 70 kg/ha of seed wheat is sowed during the period from late October to early December. Since seeds are sowed in the path of the animal plow employed for fallowing, the ridges are inevitably irregular. Manure is not supplied in most cases.

* Care of Fields: Not performed in most fields.

* Harvesting: Harvesting is done in the latter part of March. Yield per ha in some fields does not amount to 1 ton.

* Threshing: Harvested wheat is gathered into piles on which cattle are made to step on. After this, wind selection is performed.

Mustard

* Varieties: Domestic varieties are cultivated.

* Sowing: About 42 kg/ha of seed mustard is sowed during the period from mid-October to mid-November.

* Fertilization: Manure is supplied in some cases.

* Care of Fields: Not performed.

* Harvesting: Harvesting period usually lasts from mid-December to mid-January, but sometimes extends to mid-February. Yield is reported to be declining due to the shortage of boron content in the soil.

* Threshing: Cattle are made to step on the harvested mustard for threshing.

* Sales: After reserving some quantities needed for domestic consumption, all the harvested mustard is sold to the brokers in respective villages.

(2) Janakpur Area

a. Brief Description of the Area

1) Location

This area occupies the southern part of Tarai Plain which extends to the border line with India. With the exception of the northern upland cropping

district lying with a mild slope, the greater part of this area is covered by paddy fields. During the wet season, districts extending south of Janakpur are occasionally inaudated to the extent that communications with other districts are totally cut off. And in the dry season, practically no irrigation water is available in these districts. However, second cropping of wheat and onion is made possible by the water supply from tube wells, though only a small area is covered by them. Paddy cultivation in these districts is therefore confined to single cropping with the exception of the southern district where double cropping is conducted on a small scale.

2) Soil

The soil texture is either loam or sandy loam. When compared with the soil in Chitwan Valley Area, the soil in this area is larger in specific gravity and also has a larger admixture of clay and silt. When the soil is dried up, soil lumps are hard to break. On the other hand, when the soil is saturated, its stickness increases markedly. Thus it appears that the soil in this area is somewhat disadvantageous for farming operation when compared with that in Chitwan Valley.

The soil acidity disclosed by the Government survey is between weak acidity and faint alkalinity, with PH value ranging from 5.05 to 7.80. Like Chitwan Valley Area, the fertilizer response of nitrogen and phosphoric acid is considered high.¹⁾⁴⁾

3) Climate

No definite discription can be given about the climate of this area due to the lack of data. Interviews with farmers and observation of climatic conditions during the survey period lead to the assumption that the climate is subtropical and that both precipitation and atmospheric temperature are higher than in Chitwan Area through the year.

b. Outline of Existing State of Farm Management (obtained through interviews with farmers and from existing data³⁾)

Farmers in this area can be broadly classified into large scale owner farmers and petty tenant farmers. There are no new settlers, and the scale of farm management in the area is fixed. A large portion of the northern part of the area is utilized for upland cropping of maize and other crops. In the flat land extending in the south of the upland cropping district, single cropping of paddy rice resorting to rain water is prevalent, but wheat is raised as a second crop in 20% of the flat land where tube wells supply water. In districts which lie south of Janakpur and are frequently inundated, double cropping of paddy is practised though on a small scale. In the northern mountainous district, potato and paddy cultivation utilizing ravine water, are conducted on a limited scale.

Although there are some different crops raised in this area, the farm management is dominantly of the simple paddy cultivation type and its scale is somewhat smaller than in Chitwan Valley Area. The number of livestock is also believed to be smaller than in Chitwan Valley. (The Mission visited the farm household operating on the largest scale in the area, and discovered that they had a total cultivated land of 12 ha, and 2 each of he- and she- buffalos and 8 cows)

2) Existing State of Cultivation Techniques

Paddy cultivation techniques which differ from those employed in Chitwan Valley Area are described below.

* Varieties: This area is a little ahead of Chitwan Valley Area in the cultivation of foreign varieties such as IR varieties, Taichung and Marindja, but domestic varieties still account for a considerable portion of total paddy production.

* Sowing, Transplanting and Fertilizer Application: Where double cropping is conducted, farmers determine the transplanting time according to the period of starting irrigation. A nursery period of 20 to 22 days is then counted backward from the transplanting time thus determined in order to decide the sowing period. Generally, the early maturing varieties for first season cropping are transplanted around the middle of June. The Mission felt that it would be possible to start the sowing operation about a month earlier than at present, if only irrigation water is made available. Transplanting period of the late maturing varieties for second cropping lasts from July to August. This is because the protraction of the nursery period to more than 30 days, which is inhibitive to seedlings of early maturing varieties, gives no detrimental influence on late maturing varieties. It occasionally happens that the stubbles of early maturing varieties are transplanted in August for second season cropping. When the paddy in submerged fields get decayed, the deteriorated hills are removed and the tillering of other hills are divided and transplanted in their place. The Mission encountered a very conscientious farmer who applied 450 kg/ha of composed fertilizer (20, 20, 0) and 80 kg/ha of potassic manure as base fertilizers and further conducted after-manuring with 165 kg/ha of ammonium sulphate in an effort to complete heavy fertilization needed for cultivation of high yielding varieties such as IR8. However, the Mission felt that farmers in this area are generally indifferent to chemical fertilizers.

* Care of Fields: Due to the lack of knowledge about agricultural chemicals and shortage of funds, pest control is not practised. The Mission was not able to hear of any instance of insecticide application for pest control.

* Harvesting: Harvesting period of early maturing varieties for first cropping is August and it of late maturing varieties for second cropping lasts from November to early December.

* Yield: The yield obtainable under the most favourable farming conditions varies largely by varieties. The yield of early maturing domestic varieties is 1.5 t/ha, whereas that of IR8 is 4.8 t/ha. The yield of late maturing domestic varieties is said to be within the range of 1.5 – 2.45 t/ha.

(3) Khankai Area

a. General Description of the Area

1) Location

In the south and southwest of the northern mountainous district of this area, there extends a wide jungle district which is being cleared and reclaimed into flat paddy fields by settlers. And in the south of this jungle district are cultivated lands which resemble Janakpur Area in appearance.

There are no natural springs of underground water in Khankai Area. However, with the Khankai River assuring water supply even in the dry season and a number of brooks flowing down from mountains into the jungle district, double cropping of paddy is made possible in this area though on a limited scale. Since the area covered by the Khankai during the dry season is extremely limited due to the lack of flow regulating facilities, survey works for the construction of necessary facilities are now in progress under the sponsorship of the Asian Development Bank.

2) Soil

The soil texture is mostly sandy loam. The survey conducted by the Nepalese Government suggests that the fertilizer response of nitrogen and phosphoric acid is rather large in this area. The soil acidity is between strong acidity and faint acidity, with PH value ranging from 4.30 to 6.55, but exceeding 5.0 at most places. No details are known about the soil in the district which is now under reclamation work.

3) Climate

At the near-by observation station (located at Barankshetra), the monthly average temperature ranges from 17.1°C (lowest; recorded in January) to 30.5°C (highest; recorded in June), and the annual average temperature is 24.5°C which is slightly higher than the value observed at Butwal. This area may be ranked between Butwal and Chitwan Valley Area in atmospheric temperature. Precipitation is somewhat smaller than at Butwal, but the difference is very small.

Table 3 Atmospheric Temperature and Precipitation at Barankshetra²)

Item	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Monthly Average Temp. (°C)	30.5	27.7	27.4	27.0	26.2	21.7	18.3	17.1	20.3	21.6
Seasonal Average Temp. (°C)	Average of wet season (June – Nov.): 26.8						Average of dry season (December – May): 22.3			
Monthly Average Precip. (mm)	323.7	733.1	629.1	512.5	113.7	12.7	3.0	22.7	18.7	16.7
Seasonal Average Precip. (mm)	Total wet season precipitation: 2,324.8 (89.8%)						Total dry season precipitation: 264.7 (10.2%)			
	Apr	May								
	27.8	28.5	(Annual Average) 24.5							
	70.0	133.6	(Annual Total) 2,589.5							

b. Outline of Existing State of Farm Management (obtained through interviews and from existing data³)

1) Scale and Type

The scale of farm management in this area is similar to that in Janakpur Area. Tenant farmers are operating on an extremely small scale, and the scale of farming operation of new settlers in the northern jungle district is not particularly large. In a general way, Khankai Area may be regarded as a paddy field area where the double cropping is conducted on a relatively large scale.

This area differs from the afore-mentioned two areas in that jute is cultivated in many fields instead of the first cropping of paddy rice and that three cropping is recently introduced in some fields where wheat is raised after harvesting the second crop of paddy rice. In addition, potato, cabbage and other vegetables are raised on a small scale.

Maize production is small. Jute demands a great deal of manual labour after harvesting to treat it into fibre, and cannot necessarily be considered a crop welcomed by all farmers.

2) Existing State of Cultivation Techniques

Paddy Rice

* Varieties: Domestic varieties are still dominant, though IR, Marindja and other foreign varieties are being introduced.

* Sowing: Before to sowing, seed rice is immersed in water in certain cases besides subjected to wind selection. Nurseries are usually fallowed after supplied with manure.

* Transplanting: Where double cropping is practised, the transplanting period for first cropping lasts from the beginning to the end of April, and that for second cropping lasts until August. The spacing is about 25 cm x 15 cm in fertile fields and 15 cm x 15 cm in non-fertile fields. The spacing is sometimes increased to 25 cm x 25 cm in fields provided with abundant irrigation water, and is often set at 15 cm x 15 cm for early maturing varieties.

* Seedling Number per Hill: Seedling number per hill ranges from 2 to 3 if the seedling is good, and from 4 to 5 if the seedling is poor in quality. The number per hill is increased when the transplanting period is protracted.

* Care of Fields: Where easy drainage is allowed, water is drained once in 8 – 10 days. The drainage operation is spoken of as air supply to hills. In some fields, flowing irrigation is carried out instead of draining water. Weeding not practised, but weeds are cut off when they grow above the paddy.

* Harvesting: Harvesting period of the first crop begins in the latter part of July, and that of the second crop lasts until around November. The yield of the surveyed fields was rather small, ranging from 0.6 to 1.0 tons per ha.

Jute

* Varieties: Domestic varieties of early and late maturity are cultivated.

* Sowing: Seed is sowed in the latter part of March after plowing into the soil about 6 t/ha of manure.

Care of Fields: When weeds grow to a height of 10 – 15 cm, cultivation and weeding are carried out with a hoe. Insect pests are causing damages on the jute, but no agricultural chemicals are sprayed.

* Harvesting: When harvested in the February – March period, the jute is left for about 8 days after piled up on the fields. Stems from which leaves have fallen are then immersed in water to make them decomposed. The immersion period of the early harvested jute is about 15 days, whereas the late harvested jute which is left until buds come into flower usually requires a 20-day immersion period. Jute thus immersed is processed into fibre during intervals of transplanting work of paddy. The yield is about 0.6 – 0.8 t/ha in dry fibre.

(4) Existing State of Researches, Improvement and Extension of Agricultural Techniques

Due to the limited time allowed for the survey, the Mission was unable to collect sufficient data and information. For details of the captioned subject, therefore, it is recommended to the report⁷⁾ prepared by Mr. Shimada, a Colombo Plan expert stationed in Kathmandu, on February 28 this year, and his three colleagues. This report has already been submitted to the Japanese Embassy in Nepal and the OTCA.

This section is intended to discuss about the agricultural development in the survey areas on the basis of data and information obtained by the Mission during its visits to experimental organizations and interviews with their staff and the Government officials.

1) Existing State of Researches on Agricultural Techniques

Since the First Agricultural Experiment Station was established in 1956 under the Agricultural Education and Research Division, its number increased gradually to the present four. These stations are engaged in basic research works intended chiefly for domestic agricultural development. Besides them, there are four Agricultural Experimental Farms serving concurrently as the Government Seed Growing Farms where experimental culture of crops is carried out. The research works covered by these experimental stations and farms are as itemized below.⁸⁾⁹⁾

1. Agricultural botany and paddy rice, wheat and maize.
2. Comparative study of agricultural equipment (such as plows, threshers, etc.); and farm operation.
3. Agricultural engineering involving the studies on such factors as sowing period, sowing density, method of fertilizer application and amount of fertilizer chiefly for application to introduced varieties; and comparative study of growth, yield and local adaptability by different combinations of these factors.

4. Detection of damage development by insects; control of Brinjal Fruit Borer with agricultural chemicals; study of the life-cycle of Fruit-Fly; efficacy test of other chemicals; and researches and surveys of different pathologies and damages caused by insects.

5. Studies on the amount of fertilizer and the method of its application for different crops.

Despite the short history of these stations and farms and the shortage of their research staff, each of them is systematically conducting various tests and experiments which the Mission noted were well coordinated though still in the initial stage. However, it was noticed that the meteorological observation is conducted not by all stations and farms and that no observation data are kept in record at the Agricultural Education and Research Division. Further, the method of compiling and analyzing data appeared to need improvement, but this may probably be attributed to the plot-design and design of experimental method.

2) Agricultural Extension and Guidance

Extension workers (called junior technical assistants; abbr. J.T.A.) are insufficient in number and quality, indicating the need for establishing better facilities and organizations for their rearing and training. The shortage of qualified workers is largely due to the deficient development of the transport network in Nepal. The Nepalese Government is fully aware of these facts and is making efforts for increasing the number and improving the quality of extension workers. The Mission felt, however, that further studies should be made for the selection of optimum methods to secure the service of more and better extension workers at an earlier date. Through the interviews with farmers, the following points were noted as noteworthy for future extension work.

1. Extension of knowledges on varieties and cultivation techniques, and establishment of a system under which new varieties can be readily introduced and cultivated.

2. Extension of knowledges on fertilizers (application of fertilizers and soil productivity, etc.)

3. Extension of knowledges on damages by insects (agricultural chemicals, spraying work, etc.)

4. Improvement of agricultural equipment, particularly of those equipment which are already in daily use, and utilization of threshers.

5. Studies on the method of extension work.

(5) Agricultural Development Plan Based on the Survey Results

Based on the comparative study of existing conditions of agriculture and extension work in Chitwan, Janakpur and Khankai, the following measures are proposed to be taken for agricultural development.

a. Fundamental Plans for Improvement of Cultivation

1) Improvement of Environmental Conditions

The prime importance is to be attached to the construction of satisfactory irrigation facilities which are indispensable for improving paddy cultivation and for assuring double cropping of paddy rice in all three areas. Irrigation facilities will also ensure effective use of arable land by allowing second cropping in the dry season.

2) Full Utilization of Natural Conditions

Topography, climate and other natural conditions that cannot be readily altered should be fully made use of for introduction of an efficient farm management compatible with them or for the establishment of a stabilized farm management through adopting diversified farming.

3) Maintenance and Expansion of Management Scale

Efforts should be directed to improving the existing agricultural equipment and introducing new ones for the elevation of farming efficiency. The present scale of farm management should be maintained, and expanded where possible.

4) Improvement of Cultivation Techniques

Development of locally adaptable cultivation techniques relating to new crops, varieties, cultivation, care of fields, harvesting, threshing, etc. should be fostered through experiments and surveys. Further, extension work directly connected with such development should be promoted under an optimum extension system.

5) Establishment of Model Development District

A Model Development District should be established to implement the plans given under items 1) through 4) above. Results of development work achieved in this district should be put in practice in other districts for selection of the most adaptable and effective ones.

b. Comparison of Three Survey Areas, and A Plan for Materializing the Development

A comparative study of the three survey areas for implementing the aforementioned fundamental cultivation improvement plans leads to the conclusion that Chitwan Valley Area is more favourable than the other two areas for the following reasons. It goes without say, however, that Chitwan Valley Area is not free from some points that need careful attention in the implementation of the plans.

1. All three areas are on the same level in their want of irrigation water.
2. Chitwan Valley Area is divided into three river terraces differing from each other in soil productivity. Crops cultivated in this area are diversified, and both paddy rice and upland cropping are possible. Further, judging from the water holding capacity of soil, one can envisage the cultivation of vegetables and fruits in this area.
3. Changes in climatic conditions, which are larger than in other two areas, can be made use of in a wide area embracing a part of Tarai Plain in the south and the area extending with a mild slope in the north.
4. Chitwan Valley Area is provided with the higher stability and better adaptability to changes in soil productivity and socio-economic conditions that may take place in the course of introducing various types of farm management.
5. Establishment of a Model Development District demands an area and an extension system which allow the extension work to be systematically carried out in and around the demonstration farms to be established in each sub-district, with the Experimental and Guidance Farm serving as the core of all extension activities. In this respect, Chitwan Valley Area excels because its middle-level terrace provides an area of ideal extension. It must be added that much can be expected of the activities of the TUA Experimental Farm whose past achievements are highly evaluated and which is expected to be expanded in scale.

Cautions for Future:

If sufficient irrigation water is made available, the decline of soil productivity will certainly accompany it. The Experimental and Guidance Farm would therefore be required to initiate immediately upon its establishment, experiments and surveys for maintenance and improvement of the growth and yield of various crops with respect to the soil productivity which is expected to decline with the establishment of irrigation facilities. The Farm would therefore be demanded to conduct experiments and

surveys on "irrigation and soil productivity," "irrigation and crops," "irrigation and crop rotation," "fertilizer and the method of its application," and other related subjects. To disseminate and extend the outcome of such experiments and surveys, it will be necessary to construct a suitable building and facilities (such as laboratory, hall, office room) and secure the supply and transport means of laboratory equipment and audio-visual aids. Attention must also be exerted to assure that the Farm is operated in such a manner that the outcome of its activities is constantly extended among farmers. It would also be advisable to construct, annexed to the above-mentioned building, a work shop for demonstration and remodelling of agricultural equipment.

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Attachment

Planted Area, Production and Yield per ha of Main Crops in Surveyed Areas

Area Item Crop	Nepal			Chitwan			Mahottari (Janakpur)			Jhapa (Khankai)		
	Area	Production	Yield per ha	Area	Production	Yield per ha	Area	Production	Yield per ha	Area	Production	Yield per ha
Paddy Rice	1,138,790	2,321,611	2.04	37,000	92,500	2.50	45,000	99,000	2.20	78,000	166,296	2.13
Wheat	172,935	226,998	1.31	5,300	6,220	1.17	2,120	2,120	1.00	1,000	1,100	1.10
Maize	449,575	899,564	2.00	22,000	46,200	2.10	5,000	8,250	1.65	4,800	8,352	1.74
Barley	26,295	28,726	1.09	50	48	0.98	225	191	0.85	50	42	0.84
Barnyard millet & buckwheat	94,200	110,689	1.18	800	840	1.05	1,000	945	0.95	400	420	1.05
Potato	42,875	289,857	6.76	1,000	11,000	11.00	275	2,585	9.40	350	3,500	10.00
Oil plants	97,000	56,800	0.59	13,500	8,437	0.62	1,400	700	2.00	1,200	600	0.50
Sweet Potato	11,670	187,725	1.61	150	2,250	15.00	60	900	15.00	50	750	15.00
Tobacco	8,245	6,296	0.76	160	112	0.70	2,350	1,880	0.80	155	116	0.75

Source: 1968 - 1969 Statistics, Government of Nepal

NEPAL

1. EXPORTING PRICE OF AGRICULTURAL PRODUCTS (1963-64)

<u>Cereals</u>	Total Amount. (Rs.)	Q'ty Md	Unit Price (Rs/Md)	Unit Price (U.S.\$/) \$/t
Paddy, unhusked	27,807,000	1,099,500	25.3	89.3
Rice, husked	99,094,000	1,995,900	49.6	175
Barley; unmilled	1,826,000	59,900	30.5	108
Wheat,	331,000	10,800	30.7	108
Maize, unmilled	13,806,000	421,700	32.7	115
Buck wheat	529,000	13,200	40.1	141
Millet	631,000	27,700	22.8	80.6
Beaten rice, husked	143,000	3,600	39.7	140
Gram, dried	366,000	11,100	33.0	116
Pulse, unsplit	3,084,000	90,000	34.3	121
" , split	631,000	20,200	31.2	110
Peas, unsplit	75,000	2,700	27.7	97.6
Mas, "	238,000	6,400	37.2	131
Rahar, "	201,000	6,100	33.0	117
<u>Vegetables</u>				
Potato	4,404,000	183,600	24.0	84.8
Sweet potato	8,000	1,000	8.0	28.1
<u>Eggs</u>				
Eggs	21,000	54,400	0.386	5.06

[N.B.] 7.62 Nepalese Rupees = 1 U.S. \$ at the fixed exchange rate.

1 Maund = 37.2 kg

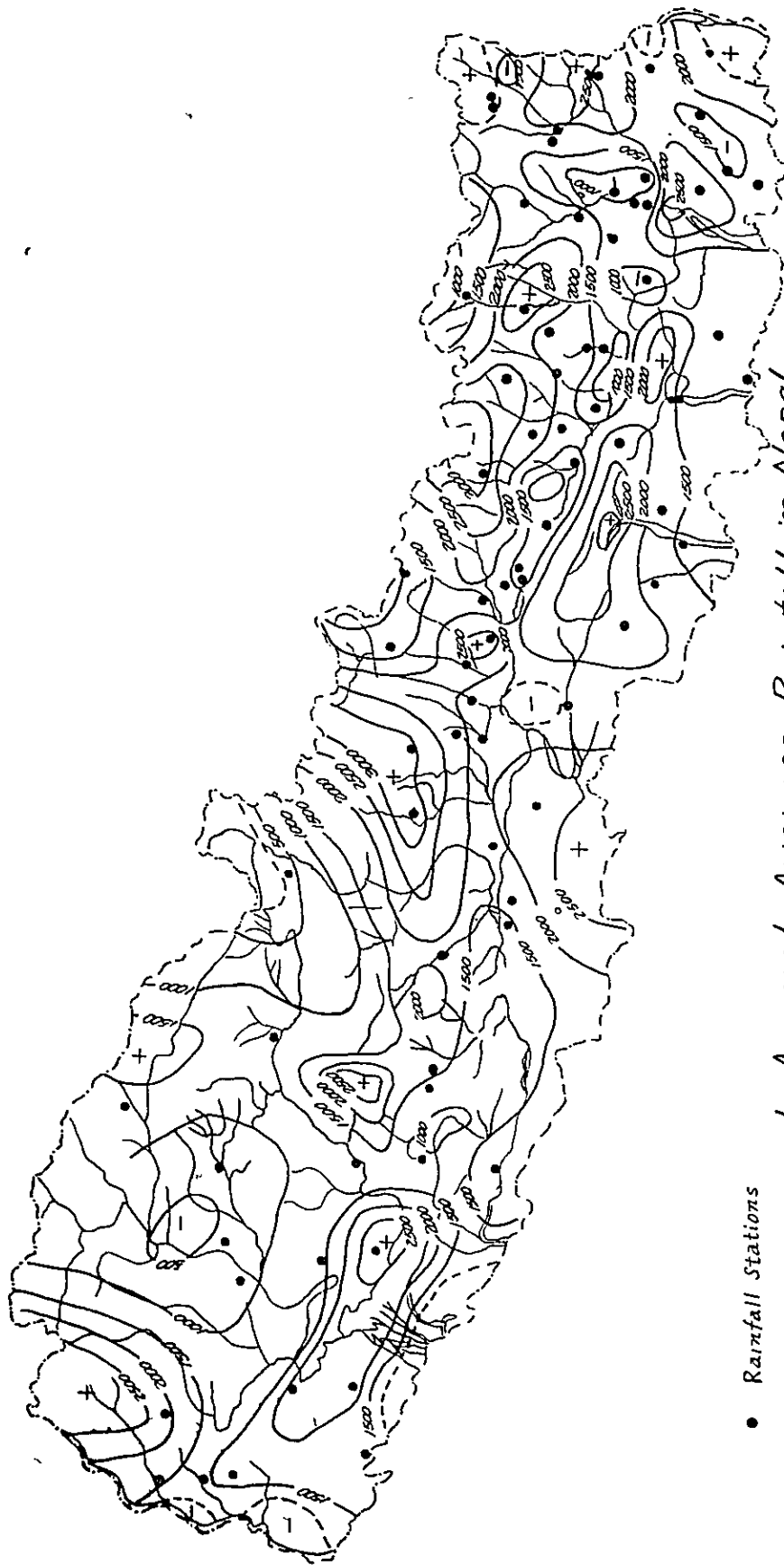
Oil Seeds & crude vegetable materials

	(Rs)	(Md)	(RS/Md)	(\$/t)
Mustard seeds (red)	20,780,000	329,100	63.1	223
" " (yellow)	110,000	2,300	47.8	169
Sesame	156,000	3,100	50.3	178
Linseed	555,000	13,200	42.	148
Caster oil seed	70,000	1,000	70	248
Soyabeans	23,000	700	33	117
Groundnuts	5,000	100	50	176
Mustard oil (black)	2,417,000	15,400	157	554
" " (yellow)	521,000	3,500	149	527
Oil cake	5,792,000	171,700	33.7	119
Herbs	6,708,000	95,600	702	2,480
Jute	13,396,000	274,300	48.8	172

Raw animal materials

		Md		
Sheep's raw wool	2,862,000	7,100	403	1,420
Bristle	1,642,000	700	2,346	6,310
		No.		\$/No
Bovine hide	3,004,000	78,100	38.5	5.06
Calf skin	513,000	29,000	17.7	2.32
Goat & sheep skin	328,000	31,800	10.3	1.35
Leopard & tigar fur	19,000	200	85	11.2

<u>Livestock</u>	Total Rs	Nos	Unit Price (Rs) \$/No.	
Buffaloes (male)	699,000	3,300	212	27.8
Buffaloes (female)	734,000	2,800	262	34.4
Buffalo calves	52,000	1,400	37	4.9
Cows & bulls	2,671,000	13,500	198	26.0
Bovine calves	22,000	200	110	14.4
Yak	12,000	100	120	15.8
Sheep & Tibetan goats	191,000	4,000	48	6.3
Goats	426,000	11,900	36	4.7
Castrated goats	126,000	1,800	70	9.2
Swine	102,000	1,500	68	8.9
Poultry	71,000	15,000	4.7	0.62
Horses & mules	167,000	500	334	43.9
<u>Dairy product</u>				
Ghee	23,495,000	Md 72,800	323	1,140 \$/t
<u>Fruits</u>				
Orange	3,428,000	No. 30,940,400	0.111	
Lemon	42,000	No. 675,200	0.062	
Banana	45,000	No. 355,200	0.127	
Mango	102,000	No. 1,385,000	0.074	
<u>Sugar & honey</u>				
Raw sugar	462,000	Md 13,000	35.5	125 \$/t
Crystal sugar	45,000	500	90	242
Refined sugar	34,000	400	85	229
Natural honey	113,000	800	141	448
Sugar cane	256,000	84,000	3.05	10.7
Tea	2,057,000	Lb 649,200	3.17	914
Tibetan tea	355,000	Lb 79,800	4.45	1,285



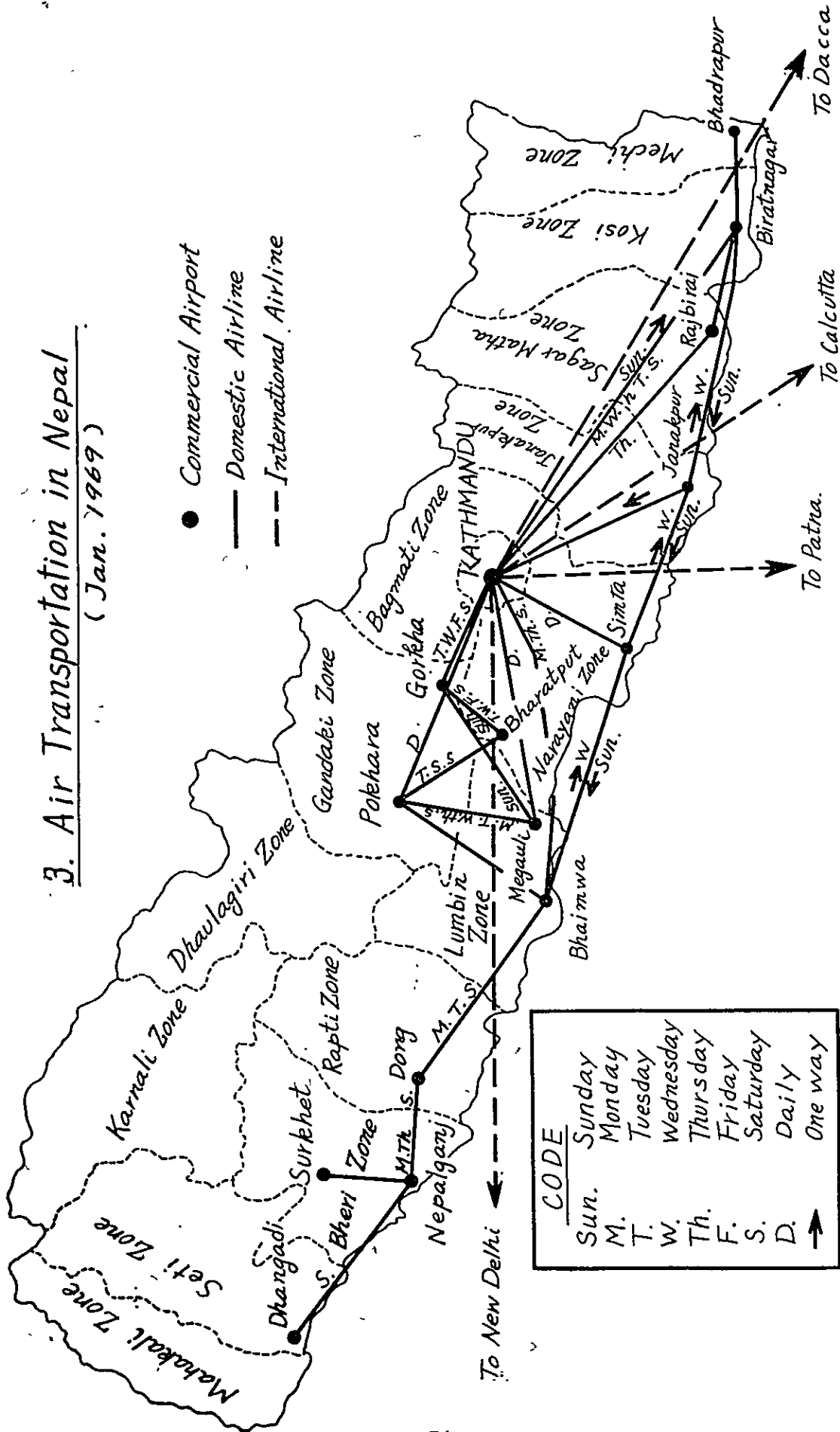
• Rainfall Stations

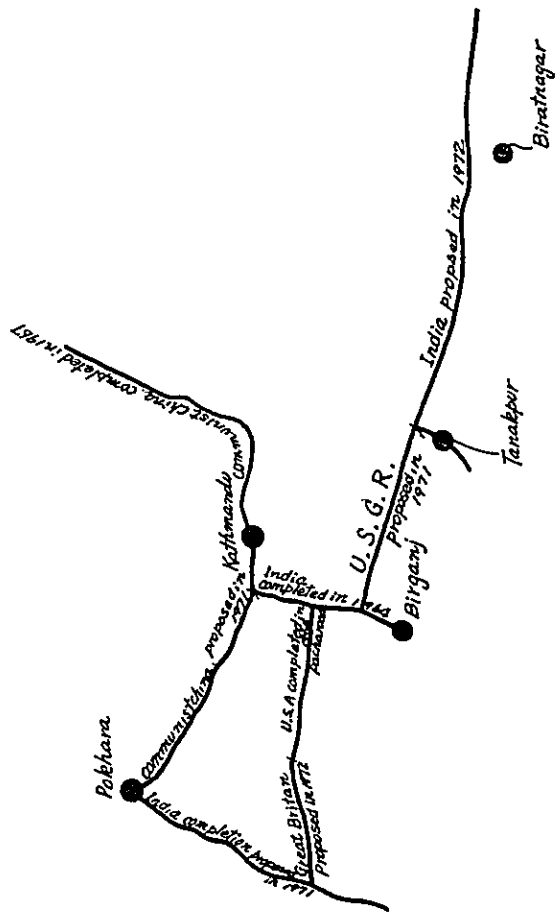
Annual Average Rainfall in Nepal

Unit: mm

3. Air Transportation in Nepal

(Jan. 1969)





TOBACCO & SPICE

		Md		
Raw tobacco	2,889,000	19,200	150	530
Ginger, dried	3,708,000	23,500	158	556
" fresh	66,000	1,700	38.8	137

3. ITINERARY OF THE JAPANESE PRELIMINARY SURVEY MISSION
(As an article in the Appendix)

Itinerary of the Japanese Preliminary Survey Mission
for Agricultural Development in Nepal

<u>Date and Day</u>	<u>Description</u>
Mar. 1, Tue	Departure of Advance Group (Leader Fukuda and Goto) from Haneda International Airport by JL 711, and arrival at Bangkok on the same day.
Mar. 18, Wed	<p>Arrival at Kathmandu by TG 311.</p> <p>Courtesy call on the Japanese Embassy in Nepal. Arrangements on survey itinerary with Mr. Teruo Shimada, a CP expert participating in the field survey.</p> <p>Interview with Mr. V.P. Dhital, Secretary of Agriculture and Food Ministry at 4:00 p.m.</p> <p>Interview with Mr. Kunio Takase of the Asian Development Bank Survey Mission for Agricultural Development in Nepal who provided the findings by the ADB's survey activities.</p>
Mar. 19. Thu	<p>Morning : Visit to Agricultural Education and Research Div., Kumal Agronomy Experimental Farm and Foreign Aid Div., under Ministry of Finance.</p> <p>Afternoon : Courtesy call on H.E. Mr. K.B. Bista, Prime Minister, and H.E. Mr. L.B. Khadayat, Minister for Agriculture and Food, accompanied by Ambassador Kira.</p>
Mar. 20, Fri	<p>Morning : Arrangements on the survey itinerary at the Japanese Embassy from 9:30 a.m.</p> <p>Interview with the Deputy Chief of Minor Irrigation, and courtesy call on Mr. K.B. Malla, Chief Secretary.</p> <p>Afternoon : Visit to ADB in Nepal and Agricultural Supply Cooperation.</p> <p>Request for supply of relevant data and materials submitted to Economic Analysis and Planning Div. of the Ministry of Agriculture and Food.</p> <p>Three members headed by Assistant Leader Kimura left Haneda by GA 875, arriving at Bangkok on the same day.</p>

<u>Date and Day</u>	<u>Description</u>
Mar. 21, Sat	<p>Arrival of the three members at Kathmandu by TH 311.</p> <p>Arrangements on the survey itinerary by all members at the Japanese Embassy in the afternoon.</p> <p>Reception held by the Director of Agricultural Extension Department at Hotel Shanker in the evening.</p> <p>Dinner party held by Ambassador Kira at Hotel Annapurna.</p>
Mar. 22, Sun	<p>Inspection of highland agriculture (Kodari).</p> <p>Reception held by Ambassador Kira at his residence.</p>
Mar. 23. Mon	<p>Arrangements on the survey activities at Agricultural Extension Department. Explanations given by Mr. B.P. Bhattarai, Director, about the agricultural extension service in Nepal.</p>
Mar. 24. Tue	<p>Departure at 10:00 a.m. from Kathmandu for Bharatpur by aeroplane accompanied by Mr. Shimada and Mr. Gyawari, Nepalese liaison officer.</p> <p>Arrangements for the survey in Chitwan Valley Area upon arrival at the TUA experimental farm.</p> <p>Inspection of the Upper Khagari Canal and Rapti Agricultural Research Centre in the afternoon .</p> <p>Visit of Mr. C. Antholt, U.S. Aid Agricultural Extension Advisor to the Mission at night.</p>
Mar. 25, Wed	<p>Morning : Explanations given by Mr. Shimada and staff members of Rapti Horticulture Nursery Centre and TUA experimental farm on their activities and the agriculture in Chitwan Valley Area.</p> <p>Afternoon : Field survey.</p>
Mar. 26. Thu	<p>Morning : The Mission was divided into three groups for field survey from different specialized aspects after the preliminary meeting at 7:00 a.m. The natural conditions group investigated the conditions of the Narayani river, riverside terraces and canals; the social group interviewed individual farmers by house-to-house visits in Kolyampur village and visited the Panchayat Office to collect data and information; the farm management group also interviewed individual farmers by door-to-door visits in the villages of Puluda and Yagyapuri.</p>

<u>Date and Day</u>	<u>Description</u>
	Afternoon ; Interview with the representative of the Government experimental farm and other staff at Chitwan District Agricultural Development Office (DADO); explanations given by them on the agricultural development in Nepal.
Mar. 27, Fri	Morning : Arrangement of data collected, and re-investigation of items demanding further clarification. Departure from TUA farm by jeep at 11:00 a.m. for Janakpur; inspection of the proposed route of Lohtar Canal, Rapti commercial fishfarm and Hitoudha commercial fishfarm made on the way before arriving at Hitoudha in the evening.
Mar. 28, Sat.	Departure from Hitoudha at 8:00 a.m., arriving at Janakpur at 3:30 p.m. Interview with the staff of DADO and ASC at Hotel Everest; information on the agriculture in Janakpur Area was furnished and arrangements were made on the survey itinerary.
Mar. 29. Sun	Morning : Inspection of the FAO pilot farms at Hardinath. Afternoon : Courtesy call paid by Assistant Leader Kimura and Mr. Shimada on Mr. D. Lhawsher, Janakpur Zonal Commissioner.
Mar. 30, Mon	Morning : Inspection of the Janakpur Agronomy Farm, and interview with individual farmers by door-to-door visits. Afternoon : Arrangement of data collected. Field survey conducted separately by individual members.
Mar. 31, Tue	Departure of Mr. Shimada and Mr. Gyawari from Janakpur in the early morning by jeep, arriving in Kathmandu in the afternoon by aeroplane which they took from Shimura. Return of Leader Fukuda, Assistant Leader Kimura and Matusmoto to Kathmandu by an FAO plane. (Survey in Seti Area in western Nepal included in the original survey itinerary was cancelled due to the inconvenience of flight service. Accordingly, Assistant Leader Kimura and Mr. Gyawari left on April 2 for survey in Kankai Area in eastern Nepal) In Janakpur Area, three members, Nakamura, Goto and Suwa continued

<u>Date and Day</u>	<u>Description</u>
	surveys on social and economic conditions through the visit to the Janakpur District Panchayat Office and District Cooperation Office as well as the door-to-door visits to farm-houses in Ramida Bhawari village.
April 1, Wed.	<p>Leader Fukuda and three members: Arrangement of the survey results, and discussions with the Japanese Ambassador and the Nepalese Government about the alteration of the survey itinerary.</p> <p>Nakamura's group: Morning – Interview with individual farmers by door-to-door visits to farmhouses, Afternoon – Arrangement of survey results and individual survey activities by each member.</p>
April 2, Thu	<p>Assistant Leader Kimura and Mr. Gyawari: Departure from Kathmandu by aeroplane and arrival in Biratnagar, and inspection of the Chatra Canal and agricultural conditions in its vicinities.</p> <p>Nakamura's group: Return from Janakpur to Kathmandu by aeroplane.</p>
April 3, Fri	<p>Kimura's group: Arrival in Bhadrapur from Biratnagar by aeroplane. Explanations given by Engineer Ichinomiya on the Kankai Project upon arrival at Nihon Koei's Kankai Camp. Inspection of the barrage site of the same project in the evening.</p> <p>Other members: Arrangement of the survey results. (Gandaki Project undertaken by the West German Mission was planned to be inspected by Leader Fukuda, Goto and Suwa when the plane tickets are available)</p>
April 4, Sat	Fukuda's group: Departure from Kathmandu for Pokara by aeroplane. Brief explanations given on the Gandaki Project by Mr. Winkler, the West German Manager, and Mr. Tewari, the Nepalese Project Manager. Inspection of the substations and agricultural conditions in Pokara and its neighbour-hoold.

Date and Day

Description

	<p>Kimura's group : Morning – Reconnaissance of the Project Dam. Afternoon – Survey of the catchment area of the Right Bank Canal whose construction is expected to be involved in the first phase work when funds are financed by ADB.</p> <p>Other members : Survey of agricultural conditions in Kathmandu and its neighbourhood.</p>
April 5, Sun	<p>Fukuda's group : Visit to the Gandaki Project Headquarters located about 3 hours southward by jeep from Pokara. Survey of agricultural conditions in the vicinity of the headquarters after given explanations on the project.</p> <p>Kimura's group: Departure from Kankai Camp, and inspection of Surunga, Sanischare and the proposed route of the Kankai left Bank Canal. Arrival at the Mechi river via Budhari and Dhajjan, reaching Bhadrapur in the evening.</p>
April 6, Mon.	<p>Fukuda's group: Visit to the Panchayat of Stall-pasal village. Inspection of farmers' experimental farm after explanations were given by the DADO officer of Shyanja village on the terminal system of the Gandaki Project. Return to Kathmandu from Bhadrapur by aeroplane in the afternoon.</p> <p>Mr. Shimada, Matsumoto and Nakamura: Flight from Kathmandu to Biratnagar, Received explanations on the Kankai Project at the Nihon Koei's Camp.</p>
April 7, Tue	<p>Fukuda's group: Return to Kathmandu from Pokara by aeroplane.</p> <p>Matsumoto's group : Morning – Inspection of the Khankai Project dam site. Afternoon— Door-to-door visits to farmhouses in Dhijon Himulal village for interview with individual farmers, and departure for Bhadrapur.</p> <p>Kimura: Arrangement of the survey results.</p>

<u>Date and Day</u>	<u>Description</u>
April 8, Wed.	<p>Matsumoto's group : Door-to-door visits to farmhouses in Salumura village for interview with individual farmers, return to Kathmandu from Bhadrapur by aeroplane in the evening.</p> <p>Other members: Arrangement of the survey results, and checking of data which the Nepalese Government was requested to supply.</p> <p>Discussions and arrangements for the compilation of survey results at night.</p>
April 9, Thu	<p>Leader Fukuda and Assistant Leader Kimura had a meeting with Mr. Upadua, Joint Secretary of Finance Ministry, after a consultation with Ambassador Kira at 9:30 a.m.</p> <p>Meetings were held individually with the following Nepalese Government offices from 10:30 a.m.</p> <p>Fukuda, Kimura, Matsumoto and Mr. Shimada: Meeting with Economic Analysis and Planning Division, Minor Irrigation Department, Agricultural Extension Department, Agricultural Education and Research Department, Horticulture Department, and Irrigation Department.</p> <p>Nakamura, Goto and Suwa: Meeting with Agricultural Supply Cooperation, Resettlement Cooperation, Loans and Feasibility Division of ADB in Nepal, and Land Reform Department.</p>
April 10, Fri.	<p>Originally scheduled final general meeting with the Nepalese Government was suspended since this day was designated as a national holiday in celebration of the return of the King to Nepal.</p> <p>Leader Fukuda and Assistant Leader Kimura had a meeting with Mr. Malla, Chief Secretary.</p> <p>Arrangements among members from 10:00 a.m.</p>

Date and Day

Description

Survey results were arranged and preparations made for return trip. (Trip via New Delhi cancelled and replaced by Kathmadu – Bangkok – Tokyo route due to the flight availability)

Dinner party held by the Joint Secretary of Finance Ministry at Hotel Shanker.

April 11, Sat Departure from Kathmandu by TG 312.

April 13, Mon Arrival in Tokyo by PA 5.

