

5. PRESENT SITUATION AND FUTURE PROBLEMS ON FARM MECHANIZATION IN PAKISTAN

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Introduction

Pakistan, predominantly, is an agricultural country. Though much progress has been made in the industrial sector of the country after the creation of this land in 1947, yet 75% of its population still depends on agriculture for their livelihood. This dependency on agriculture is still higher in East Pakistan where 85% of its total 55 million of population is directly dependent on farming for their subsistence. But still, the over-all farming standard of the country has yet remained to be one of the lowest in the world and very little improvement was made in this sector until very recent times when the problem attracted the attention of all concerned and Govt. has been attaching top priority to the matter.

General condition

The two wings of Pakistan, being situated about a thousand miles apart, have completely different types of soils, climate of East Pakistan being in tropical zone and West Pakistan in arid or semi-arid zone.

East Pakistan

Location and climate

East Pakistan is situated at the southeast corner of Indo-Pak sub-continent having border with the Republic of Burma at the south end of its eastern boundary and facing the Bay of Bengal directly to the south. On the west, the north and part of the east, the country is surrounded by the Indian Republic. The geographical location of the province is between 20.5° N at its southern most tip to 26.7° N latitude and 88° E to 92.5° E longitude. This wing of Pakistan comprises an area of about 55,000 sq. miles. The climate is humid with an average temp. of 52°-95° F and an average annual rain fall of 80". The range of rainfall is about 50" towards the western side of the province and may go up to 200" in some years towards the eastern and northern districts of the province. But the country being under the influence of Monsoonic weather, this huge amount of rainfall is far from evenly distributed throughout the year. The major portion of this average rainfall is precipitated during the months of April to September about 70" and during the remaining 6 months of the year hardly 10" of rainfall is available. In fact, during the winter months of December-April which are rightly called the dry season in the country, there is no more than 2"-4" of rainfall for the land.

The hottest months of the year are July and August.

Topography and soil

East Pakistan is a vast stretch of deltaic plain land except a few hills and Jungle areas at its eastern and northeastern border which comprises only about 13% of the

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entire land. The average altitude from sea level is below 80', excluding hilly regions, but about 50% of the land lies at an average altitude of 15' only. The slope is from north to south towards the Bay of Bengal.

The soil of the country is mostly alluvium-formed by the deposits of the three great rivers and their numerous tributaries—the Padma, the Meghna and the Brahmaputra which flow through it. The whole country has been crisscrossed by these rivers and their tributaries and rightly the country is called a truly riverine country. These rivers flow a total length of about 15,000 miles and comprises an area of about 5% of the entire land. The origins of all these 3 great rivers are outside the country, at the Himalayans, and they flow for their major parts through India and then enter this province to meet the sea at the Bay of Bengal. They discharge a catchment of an area of about 0.62 million sq. miles of which only about 7% is in the province. These rivers are real booms to the country; the natural fertility of the soil of the country is due to their annual silt deposition; they are perennial source of water for the almost entire rural population of the country which is about 95%; they provide us with abundant supply of fishes, the main source of portion in the food of the people; they form the main part of communication system in the country; and they are major source of surface water for the ambitious irrigation plans which are under gradual execution for a total improvement of agriculture of the country. But these rivers are also the most devastating havoc creators in the country. As they have been also draining an area outside the country which is about 13 times bigger than the province's itself and as their beds are being gradually silted up, they bring floods every year regularly, small or big and cause heavy damages to property, crops, domestic animals and even human lives. Frequently they are largely drifting away along with their terrific rush of water, thousands of entire villages with every thing in houses, animals and human beings. Damage to crops is a regular feature by their floods and some time the extent is catastrophic. But the worst part of it is that their arrival time in successive years is sometime late sometime early, thus giving no opportunity to take precursory measures or to set up a changed cropping schedule. As everybody knows, this year also we have had a real big one and amongst others Japan Govt. also so kindly donated to us 10,000 tons of rice as flood relief.

However, according to soil type, the land has been classified into seven major tracts as follows:

1) Red soil tract or Modhupur tract:—Comprises an area of 4,000 sq. miles. The soil of this tract is red laterite, is above flood level, is clayey in nature and is deficient in N., Organic matter, phosphorus and lime.

2) Barind tract:—It covers an area of 5,000 sq. miles and belongs to an old alluvium formation, of reddish brown colour, is deficient in lime, No and organic matter like red soil of Modhupur tract. In the gentle depressions of both these tracts transplanted Aman paddy or winter paddy is grown.

3) Tista silt:—This tract covers an area of 6,500 sq. miles. This represents a silty loam similar to ordinary silt soil of East Pakistan. The soil is fertile and is generally well supplied with potash and phosphate though rather poor in lime. Responses to fertilizer application are good. Paddy, sugar cane and tobacco are the main crops.

4) Brahmaputra alluvium:—It comprises an area of 16,000 sq. miles. The soil is very fertile and is replenished by fresh deposits of silt every year carried down by flood water. Almost all kinds of crops are grown of which paddy and Jute are main. In low lying areas, Broadcast Aman is grown, normally fertilizer is not applied but its application is preferable to get higher yields.

5) Gangetic alluvium:—This tract covers an area of 10,500 sq. miles. It represents the riverine lands of the gangetic plains, and the soil is rich with high calcium content and is generally well supplied with phosphate and potash. The texture of the soil varies from clay loam to light sandy loam.

6) Coastal saline tract:—This tract's area is 6,000 sq. miles and represents a flat low lying area generally at the mouths of the rivers. At the south-western part of the province facing the sea are the "Sundarbans", a region of morass and swampy islands, most of which are clothed with dense ever green forests and some are covered with salt water of the tidal floods. The soil is saline and well supplied with potash and phosphate. It is here in this Sundarbans that famous Royal Bengal Tigers and huge pythons are found besides numerous monkeys and beautiful deer.

7) Hill tracts:—This tract also covers an area of 6,000 sq. miles. The soil in this tract consists of red clay with a mixture of fine sand of the same color. On the whole the soil is poor and the cultivators have to struggle hard to extract a living from it. The area is mostly under "Jhum" cultivation i.e. clearing of Jungle and burning the same just before the onset of rainy season and then sowing seeds or rather putting seeds in individual holes made by hard implements only throughout the whole area.

Agricultural condition—(All the data are based on 1961 census).

The total population of East Pakistan was 50 million in 1962. Now it is supposed to exceed 55 million. Of this 94.8% was rural population. This figure is believed to remain almost unchanged through the last decade specially in East Pakistan where the pace of industrialization has been comparatively very slow. The population density stands at 979 persons per sq. mile with a maximum of about 1200 per sq. mile in some districts. Literacy of population was 21.5% of which that of rural population was 20%. This figure has increased substantially in recent years and is believed to be about 30% in total. The growth rate of population has been on the average, 1.8% per year. Of this huge population, which is rather very high, about 80% is directly dependent on agriculture without any alternative choice of livelihood.

Land utilization in the country is as follows:—

| | 35.0 | million | acres | |
|-------------------------------|------|---------|-------|-----------------------------|
| Total land area | 21.0 | " | " | |
| Total cropped area | 10.0 | " | " | |
| More than once cropped area | 31.0 | " | " | |
| Total acreage | 1.5 | " | " | (crop intensity about 145%) |
| Current fellow | 1.5 | " | " | |
| Cultivable | 5.5 | " | " | |
| Forest | 5.5 | " | " | |
| Net available for cultivation | | | | |

(Rivers etc.)

Average size of holding and numbers thereof:—

| Size (acres) | Number (millions) | Percentage |
|--------------------|-------------------|------------|
| Under 1.00 | 1.11 | 17% |
| 1.0 to under 2.5 | 1.75 | 26.6 |
| 2.5 to under 5.0 | 1.76 | 26.7 |
| 5.0 to under 7.5 | 0.83 | 12.6 |
| 7.5 to under 12.5 | 0.64 | 9.7 |
| 12.5 to under 25.0 | 0.31 | 5.6 |
| 25.0 to under 50.0 | 0.09 | 1.4 |
| 50.0 and over | 0.02 | 0.3 |
| Total | 6.57 | 100 |

From the above tables it will be seen that there is about 6.5 million holdings in East Pakistan of which more than 70% possess less than 5 acres which is regarded as economic size of holding. The average size of holding on the whole is 3.5 acres. The type of holding thereof is shown below.

| Type of holding | Percentage of holding | Average size of holding | |
|-------------------------------|-----------------------|-------------------------|----------------------------|
| | | By total area (acres) | By cultivable area (acres) |
| 1. Owner cultivators | 62.1 | 3.2 | 2.7 |
| 2. Owner cum tenants | 35.6 | 4.2 | 3.8 |
| 3. Tenants | 2.3 | 2.5 | 2.3 |
| 4. Total cultivators holdings | 100 | 3.5 | 3.1 |

Cattle population

We have here about 19 million bullocks and about 4 million buffalos together with a few millions of goat and sheep according to a recent estimate and about 21 million poultry birds. Of these 23 million of cattle, about 10 millions are working animals which constitute the only source of farm power. But these cattle have no specific breed and are the most wretched animals in the world. They are never systematically fed, bred or taken care of. 55 million of people and more than 23 million of cattle are in competition here for a product in 21 million acres of land. The man and land ratio and men and animal competition on an average farm, thus, pose a serious problem to proper maintenance of draft animals which are progressively becoming too ineffective to handle farm operations. In fact, they are completely degenerated and fatal cattle diseases are rampant in the country.

It will be seen from an analysis of the above facts that about 2.7 units of human beings and ever 1 unit of livestock have to subsist on one acre of land. But yields per acre being one of the lowest in the world, the case of feeding these cattle population has been completely neglected. To consider the actual fodder area in the country, about 241 units of cattle are to depend on an acre of land, whereas the requirements, according to expert opinion, is fodder from one acre per 5 units. The figures are really incredible but these are the facts here. Our cattle is left to nature for their feeding completely and to the by-products of farms, mainly dry rice straw for the whole of the year. But the size of natural grazing grounds also has come to

almost nil position by this time, except the road sides and holding boundaries. Hence, dry rice straw has become the only feed for them, which also having been taken into consideration, the number of cattle units to subsist on an acre of land comes to 46.

Cultivators' condition

So, on the average there are 44 millions of people here depending entirely on agriculture over 6.5 million holdings of an uneconomic size of average 3.3 acres. But this family unit is not a concentrated one at all, and it is a scattered collection of small, rather very small holdings with an inexorable future of breaking up into yet smaller holdings due to law of inheritance. His size of holding being such, his production level being one of the lowest in the world and his average family size being of seven numbers, the average farmer in this country is a very poor man, mostly illiterate and of ill health. He is underfed, underdressed and badly in debt. He has no capital at all for his only profession of life. His input in the farm is almost nil except low grade seeds and his labor and that of his pair of delapidated bullocks only. Then, there are regular natural calamities of floods and draughts and insect pests and diseases. There are almost no measures against them and his farming is nothing but a gambling. He uses no modern appliances but the age-old indeginous implements of very low efficiency. His average per capita-income is Rs. 191.00 only annually and it has remained almost unchanged during the recent years as against Rs. 443.00 for non-farming population. The national income, which showed an increase of 5.8% in 1960-61 and 9.8% in 1961-62 was entirely due to increase in industrial income.

But something has to be done about this and that is the scope of this treatise.

Main crop and production (1961-1962)

| Crops | Acreage (million acres) | Production (million tons) |
|------------|-------------------------|--------------------------------------|
| Rice | 21 (present 23) | 9.5 (present 11.7) |
| Jute | 2.06 | 6.97 million bales (1 bale=400 lbs.) |
| Sugar cane | 0.29 | 4.42 |
| Tea | 0.08 | 59 million lbs. |
| Tobacco | 0.11 | 0.031 |
| Potato | 0.14 | 8.6 million munds (1 mnd.=82 lbs.) |
| Wheat | 0.15 | 0.04 |
| Banana | 0.08 | 1.06 |

But as has already been stated, the production level is very low for almost all the crops. The per acres yield of rice, the main crops and also the staple food for the people of the country, is as low as to be only 1/3rd or even 1/4th of that of the countries advanced in rice production. The average per acre yield of unhusked rice in this country is only about 1,475 lbs at present which was even lower a few years back also.

Rice being the main crop of the province, some more discussions about it will not be out of place here. Having a very favourable climate we can grow 3 rice crops in a year in the country, namely the—(1) summer rice or "Aus" which is sown broadcast generally in the month of April after there has been some amount of rainfall for land preparation and seed germination and harvested in the month of July-August. But due to uncertain monsoon in some years, the sowing is very much delayed and there is a bad crop. Again in some years due to early flood there is heavy damage.

Moreover, the threshing and drying of grains of this crop in the rainy season has always posed a serious problem. Present acreage of this crop is 8.2 million acres and production 3.1 million tons. Then, (2) transplanted "Aman" rice or winter rice, transplanted in the months of July–August and harvested in the months of November–December. This is by far one rice crop with an acreage of 14.7 million acres and production of 6.8 million tons. This crop also suffers from the vagaries of nature. Insufficient rainfall sometimes makes transplantation difficult and late floods in some year causes heavy damages. (3) The third crop is "Boro" or spring rice transplanted in the month of December and harvested in the month of May. This being in the dry period, its acreage is very much limited due to lack of irrigation facilities. But the season is the safest one having no danger from floods or draughts if only irrigation can be provided. The yield rate also is better. Its present acreage is only about 1.5 million acres with a production of 0.8 million tons. The total rice production trend in the province has shown an increase of about 53% during the last decade up to 1968 in view of use of increased amount of fertilizers, adoption of plant production measures and use of their inputs of agriculture in larger quantity which has been possible by vigorous extension driven by the agricultural staff of the country.

Yet, this province is still a food deficit area—we are to import about 10% of our requirements i.e. about 1 million tons every year at the cost of a huge amount of precious foreign exchange. But during the dry period i.e. from December to April all the culturable land of the country remains fallow except the above mentioned area of 1.5 million acres only of Boro rice under irrigation, out of total 23 million acres. If only irrigation can be provided we can have a maximum utilization of this vast land resource in the winter months to attain the goal of self-sufficiency at least in food. Govt. is very much keen about it and already ambitious schemes and plans have been drawn up to this effect. But for this intensive cultivation, we need quick moving operational units in every step of farming for which the present condition is just out of place. In fact every body nowadays is thinking of changing the entire cropping pattern from a rainfall farming to controlled water farming and shift the bulk of it to these winter months with adequate irrigation facilities. For, the present two main rice crops of "Aus" and "Aman" are nothing but a gambling affair, as mentioned earlier, played by a whimsical nature.

Need for farm mechanization

Such, then, being the agricultural conditions of the province and of the farmers thereof who constitute the over-whelming majority of the country's population, the need for a drastic change in the pattern of things to induce an over-all improvement in the farming conditions, is more than imperative. Fortunately works have already been started vigorously in the line and the Govt. and also the people of the country are fully aware of the situation and have been attaching top priority to the matter.

But, for any kind of improvement in this basic industry of the country, rather of the whole of the humanity, technological development for every aspect of its operations, is the only solution. For, today's scientific or improved farming is nothing but the use of modern and latest techniques which is not possible at all without the help of modern appliances. Machines are nothing but these modern appliances or devices invented and developed by an ever-progressing mankind through the ages to bring out a richer and fuller life for himself and the mankind by exploring to the fullest extent the resources nature has strewn all around him. But in this country, full of those resources in the form of a vast land-rich and fertile and teeming millions of a nice people eager to work and live better and also a tropical climate most suitable for almost any kind of crop production, not to speak of any richer or fuller life, but

most of its people have been half fed and half clothed throughout the year and year after year. We must not forget and these people must be given to understand that by a machine we can always do a better job and more of it in less time, by less labor and less cost and, more comfortably. All these implies a better production both in quantity and quality. Besides, a more sophisticated aspect of this mechanization in every sphere of human life including of course farming, is to give him a status as a mankind in this modern age of technology so that he has not to stagger in the path of his life like an animal under a heavy yoke. This will bring out a tremendous psychological change in him—he will feel elated and his prestige increased. He will have a broadened outlook and will very soon break through the age-old traditions he has been following most unsuccessfully in his way of farming and his way of life. This is very important in this country where the average farmer who leads a rather most wretched life and pursues a most un-economic profession as a farmer, himself thinks to be in the lowest strata of social position and can seldom imagine of any kind of change even in his life time.

So, introduction of some of these machines in his farm and supply of adequate power for the same, is an necessity to save him from sure liquidation. For, as has already been stated, his only source of power in the farm is that pair of bullocks of no bred, almost unfed, completely degenerate. Naturally his operations are less than halfdone, and he cannot keep pace with the season and utilizations of his labor and his land becomes disastrously handicapped. Mechanization is needed still more urgently for the complete change of cropping pattern and shifting of it to the now-un-utilized dry season as mentioned earlier and subsequently to cope with time for more intensive utilization of that safe period.

Criticism against mechanization

The most formidable criticism against mechanization has been due to fear of labor displacement and consequent unemployment amongst the rural population. The difficulties of farm mechanization under existing socio-economic condition of the country also have been a salient factor raised by the critics against mechanization. These difficulties and their probable solutions will be dealt with shortly and before that to speak about the labor displacement, this is baseless inasmuch as additional labors will be needed to handle the increased volume of work brought about by more intensive utilization of land through mechanization and also to cater for the needs of improved living standard to be achieved through that increased value created. Besides, total mechanization surely is not going to take place all on a sudden in this country. It will have to come gradually and rather very slowly at the beginning and almost flutteringly in view of the formidable difficulties it faces now and before it gains sufficient confidence of an ignorant and rather conservative farming population.

Problems of mechanization and their solution

(1) Most of the farmers of the country, being illiterate, do not even have any idea of a better way for managing his affairs and generally lack in the belief of a better performance by modern appliances than his existing ones. To tackle with the situation, vigorous extention activities through practical demonstration, mass education through Radio, T.V. and news papers and public meetings and extensive use of farm machinery in the Govt. demonstration farms, will go a long way. This is most natural that as soon as the benefits of farm mechanization are made abundantly clear to them, this honest and simple folks will gladly come forward to accept them for the sake of their own interest and in the interest of their hungry children and beloved ones.

(2) Fragmentation of the holdings to a very miserable extent is another big prob-

lem in the way of mechanization and also the limitation of holding size. To consider the fragmentation, we are to have a selection of machines to be used, at least for the time being to begin with. That way it is not possible to have large machines for the primary introduction. We should find out something which are capable of being operated in these lands as it is now. And then after the machines have gained some roots in the soil of the country, we can gradually go for bigger machines, more economically through farmers co-operatives etc. Of course this cooperation amongst the farmers under the present socio-economic condition coupled with illiteracy of the farmers, has been found to be a very difficult proposition to be accomplished, but as has already been stated, with the advent of mechanization and consequent improvement of all his conditions, his outlook will be broadened and this also will become easier.

About the limitation of holding size, the introduction should be at first with the individual big growers. According to the foregoing statistics the number of holdings in the country with average size of 12.5 acres to under 25 acres is 0.37 million and that of holdings with average size of 25 acres to under 50 acres is 0.09 million. The economic size of a holding to maintain a power tiller has been found to be 15-25 acres and for intensive cultivation with 3 crops a year, even 10-12 acres are sufficient. So, the above numbers of holdings will be more than sufficient to provide a field for gradual introduction of farm machinery in the country. But these people are to be persuaded at all costs to begin with the job.

(3) Problem of capital: Capital formation by the farmers of the country is quite negligible. For majority of them there is simply no capital. As such, unless Govt. or any other agencies advance capital in the form of loan, all the future plans of improvement in this sector will become futile for want of inputs to the soil. Fortunately the Agricultural Development Bank of Pakistan has been doing the job with credits. But its procedures for loan giving should be made easier for the illiterate village folks to manage with, specially the price of the land to be mortgaged for the loan should be fixed at higher rates, so that more of the farmers can utilize the benefits provided by the Bank.

Besides, it is the opinion of many in the line that Govt. should provide subsidy on the price of the machinery as it has been giving on the use of fertilizer, irrigation water and plant protection services and chemicals, the last one being completely free.

(4) Lack of technical knowhow on the part of the users of the machines and of servicing facilities:—The level of technical knowledge in the country is almost zero. But for a success in mechanization of any kind this is the 1st prerequisite. The solution, in our opinion, should be two-phased; 1st, the owners of these machines should have a short training in the operation, handling and day-to-day maintenance of them—this may be called the owner-operators' training course and 2ndly, the country should build up an infra-structure of skilled mechanics who will go for major repairs and servicings of all the machines involved and also all kinds of farm power units and other implements and attachments. The Farm Mechanization Training Institute to which I belong, has been doing the job for the last 10 years and we have already trained about 500 Agricultural Extension staff and about 600 advanced farmers in the 1st course and are shortly going to open the 2nd course also to produce mechanics. This aspect of technical training is very important to execute any kind of mechanization plan without which the whole superstructure will tumble down soon.

In fact, we have been already experiencing great difficulties in this respect and of the total number of power tillers introduced in the country within last 3-4 years, more than 50% of them have gone out of work within 6 months to 1 year of their introduction simply due to mishandling and had maintenance by an ignorant user and

due to lack of servicing facilities and non-availability of spare parts sometimes. This sort of situation is very dangerous, specially at the beginning of the introduction which is very much apt to hinder further introduction tremendously as farmers will very soon loose whatever confidence they gained about these machines and will shortly go back to their traditional conservativeness. About servicing centers, random introduction should be avoided in the beginning, instead, localized intensive introduction through Govt. supply or at highly subsidized rate should be followed with all the facilities, right at hand, of servicing, repair and availability of spare parts etc. Thus examples will be created and for reasons of plain economics wider introduction will automatically follow in.

Role of the power tiller in the farm mechanization of East Pakistan

As has been already seen, the problems of farm mechanization in East Pakistan has been due to fragmentation of holding, very precarious economic condition of the farmers, lack of technical knowhow, to which lack of communication facilities in the rural areas can be added. Besides, special cultural practices for rice cultivation like puddling or wet field cultivation for transplanted type of rice is also an important factor deserving consideration. It means we need special type of machinery suitable for rice cultivation under our special conditions.

In the past we have, sometimes, tried to use some machinery for farming, mainly the big ones like 4-wheel tractors which could never do the wet field job in low lying areas for rice cultivation due to its heaviness. We were looking for something suitable for the purpose. Transplanted type rice being the most important of rice crops, we have to find out some type of machinery for puddling in low lying areas also. Moreover, the recently introduced improved varieties like IRRI are all transplanted types.

We already knew that Japan is an important rice producing country, but it was after 1960 when under a joint project of Govts. of Pakistan and Japan an Agricultural Extension Training Institute was established in Dacca to train our Extension staff in the techniques of improved rice production, that we came to know more about farming in Japan. Some Japanese farm machinery and other equipments mainly power tillers equipped with a small irrigation pump and other important attachments for rice cultivation were also donated by the Govt. of Japan for the project along with expert services of 7 Japanese advisors. These machines opened a new era in the history of our farming. We could find the machine in them we were in search of. We could understand that being small and compact in size, they are far lighter than the big 4-wheelers, capable of tilling our fragmented land and also suitable for the socio-economic conditions of the farmers. They are comparatively cheaper in price due to the size, are less complex than the big machines and thus can be operated by the farmers themselves with a short course of training instead of hiring a skilled hand at a high wage for the purpose which his economic condition will never permit. Again, they will have a free access to the remote corners of the villages. Within a short time it was evident that these are the machines for our farm mechanization, at least to begin with and in 1962 a committee was set up to test different makes of power tillers, for the purpose of standardization in the country. Self was a member of that committee and have been still working in that capacity in subsequent committees including the present one working for the purpose.

In all about 20 different makes of power tillers, mainly Japanese, along with ones from U.K. and West Germany took part in the test which was continued for different seasons under different working conditions. After a careful study of the test results,

5 Japanese models were selected for standardization. They are, 1) Satoh, 2) Kubota, 3) Yanmar, 4) Iseki and 5) Mitsubishi. Subsequently Hinomoto was standardized by the the present committee. This power tiller coupled with an irrigation pump of suitable capacity to be operated by the engine of the tiller, a power thresher, a trailer and other important attachments have been considered to be a good mechanization unit to be possessed individually by the big and middle class growers of the country which will be quite proportionate to their holding size and fragmented condition.

Efficiency of power tiller:—It has been very liberally estimated that the cost of land preparation by power tiller has cut down the expenditure by about 60% and time saving has been more than 80%.

Present status of farm mechanization

The following tables will throw some light about the above caption.

Yearwise and makewise number of power tillers imported

| | 1965 | 1966 | 1967 | 1968 | 1969 | Total |
|------------|------|------|------|------|-------|-------|
| Iseki | — | 50 | 217 | 117 | 195 | 579 |
| Satoh | 50 | 90 | — | — | 90 | 240 |
| Kubota | 50 | 100 | 142 | 223 | 301 | 816 |
| Yanmar | — | 395 | — | 127 | 278 | 800 |
| Mitsubishi | 128 | 105 | 184 | 192 | 333 | 942 |
| Total | 228 | 746 | 543 | 659 | 1,203 | 3,379 |

Yearwise and makewise distribution of power tiller

| TTT | Iseki | Satoh | Kubota | Yanmar | Total | |
|------------|-------|-------|--------|--------|---------|------------|
| | | | | | Private | Gov't use |
| Up to 1965 | — | — | 50 | — | — | 50 |
| 1966 | 15 | 88 | 24 | 49 | 88 | 88 |
| 1967 | 41 | 76 | 207 | 263 | 568 | 19 |
| 1968 | 214 | — | 140 | 193 | 436 | 111 |
| 1969 | 87 | 36 | 163 | 101 | 374 | 13 |
| Total | 357 | 200 | 584 | 606 | 1,466 | +281=1,747 |

1,747+606 (of Mitsubishi make for which specific data could not be available)=2,353

It will be seen from the above two tables that up to the end of 1969, about 1,000 power tillers remained undistributed which fact tends to draw a gloomy picture of mechanization in the country. But as has already been stated, the difficulties of servicing and maintenance facilities, non-availability of spare parts, specially very exhaustive price of these parts and the complexity of loan giving procedures on the part of A.D.B.P. are mainly responsible for creating such a situation. On the other hand, the price also of these power tillers are being considered by many as to be rather on the very high side. A power tiller of 6-8 hp diesel engine with standard attachments costs Rs. 7,500/- to Rs. 9,000/- at present.

Uu-to-date total number of different kinds of farm machinery in the country:—

Tractor:—1,941; owned mostly by Govt. farms and commercial firms like tea

gardens, sugar cane cultivation farms etc. Their origins are all in Western countries. But recently 2 Shibaura tractors of Japan have been standardized.

Power tiller:—2,353.

Irrigation pumps:—Agricultural Development Corporation—about 19,000 of mostly 2 cusec capacity—(cusec=cubic foot per second and about 2,500 of different capacity, mostly fractional (less than 1 cusec) owned by private farms.

Deep tube wells for irrigation:—A.D.C.—operating about 2,000 and private farms about 33.

Power sprayers—14,000 hand sprayers and dusters—33,000.

But the scope of all kinds of farm machinery in the country is enormous. According to F.A.O.'s. Indicative world plan for April. Improvement, a minimum of 0.2 hp per acre is necessary for developing countries. In U.S.A. the available hp per hectare is 1.02. According to the number of work animals, we have only 0.5 unit per acre, the hp of which will not be more than 0.075. So, to bridge up the gap up to at least that minimum of 0.2 hp per acre, we need a total of 2.5 million hp in the form of farm machinery in the country. But we want to eliminate these worthless animals from the farm and in that case a total of 4 million hp is needed.

And this is absolutely necessary for the previously mentioned irrigation works in the dry season, for the urgent plant protection measures which sometimes cause very heavy damage to the crops. In normal years also when there is no heavy attack, the cumulative damage effect of all the pests and diseases, according to a very conservative estimate, is about 10–15%.

In 1967–68, only 2.7 million acres out of total cropped acreage of 31 million acres were treated and savings thereby in terms of money was estimated to be to the tune of U.S. dollar 18.6 million. Now, the amount of savings, if the whole area can be treated, can easily be imagined.

West Pakistan

As has already been mentioned, West Pakistan has a completely different climate and soil type than that of East Pakistan. This area is situated in arid or semi arid zone with an average annual rainfall of range of 5"–25" only as compared to 80" of East Pakistan. It varies from 4" a year in the South to 40" in the North.

The area of this wing of Pakistan is 310,452 sq. miles or about 198.6 million acres—about six times bigger than East Pakistan. The climate of the country is continental. Summer is very hot when day temperature may exceed 115°F and in winter the night temperature falls below freezing point in the northern districts. The hottest months are July and August.

On the basis of soil classification, West Pakistan has been divided into 6 (six) physiographic regions, namely, 1) northern highly region, 2) western hilly region, 3) Pothwar Plateau, 4) Indus Plains 5) sandy deserts and 6) coastal deltaic region. Of these only the Indus Plains which comprises an area of about 50 million acres, about ¼th of the total geographic area of the country, is agriculturally important and the remaining regions are almost non-productive.

The soils of this region contain high percentages of silt and fine sand. They have generally a favourable texture and a high potential productivity but are rather deficient in Nitrogen, Organic matter and phosphorus. Extensive canal irrigation system, one of the biggest in the world, has brought a large area under cultivation, which on the other hand, has led to the development of water logging and salinity causing huge damage to these fertile soils. It is estimated that a total of about 27 million acres has been suffering from these two great evils in the area.

Land utilization: According to planning unit, Ministry of Agricultural and Works, Govt. of Pakistan, in 1967-68 the cultivable area of the country was 47.6 million acres of which 39.2 million acres were cropped and an area of 31.4 million acres was found to remain as culturable waste.

Size of holding: According to 1960 census, there were about 4.9 million holdings in West Pakistan with an average area of 10.1 acres per holdings. Nearly 49% of these were of less than 5 acres, but they accounted for only about 10% of the total agricultural area, where as only 8% of these farms possessed more than 25 acres, but they covered 42% of the total farm area.

Land tenure: Out of 4.9 million farms, 41% were owner operated, 17% were owner-cum-tenant farm and 42% were tenant farms. Nearly 51% of total farm area was self-operated and the rest through tenants.

Fragmentation of holding was common and 61% of farms were fragmented covering 81% of the total farm area. But recently, consolidation of holdings program has been working vigorously and already more than 13.5 million acres of land have been consolidated.

Area and production of main crops in West Pakistan—Average of 1967-68 (source—Planning Unit, Ministry of Agril. and works, Govt. of Pakistan:—

| Crops. | Area (thousand acres) | Production (thousand tons) |
|------------|--------------------------|-------------------------------|
| Wheat | 13,995 | 5,293 |
| Rice | 3,496 | 1,460 |
| Sugar cane | 1,420 | 20,001 |
| Maize | 1,436 | 689 |
| Fodder | 6,883 | 44,456 |
| Cotton | 4,207 bales | 2,757 |
| Tobacco | 173 lbs. | 2,971 |

Production trend:—This has shown a quite satisfactory increase during the recent years due to the firm determination of Govt. to give top priority to agriculture. According to the Planning Unit, Ministry of Agricultural and Works. Govt. of Pakistan, the production of wheat in the country has increased from 3.85 million tons in 1965-66 to 6.51 million tons in 1968-69. This tremendous achievement has been possible mainly through introduction of high-yielding varieties of these cereal crops and the application of other inputs at increased rates. During the same period rice production increased from 1.3 million tons to 2 million tons and that of cotton from 2.33 million bales to 2.96 million bales. But still the per acre—yields remain quite low in comparison to other advanced countries leaving a vast scope yet for further improvement for which adequate farm power is an essential factor.

Animal power: The number of these animals was estimated to be 10.5 million in 1965. They, here, are far more stronger and usable as farm power than those in East Pakistan.

At present the available farm power from all sources is about 0.1 hp per acre. In view of the minimum of 0.2 hp per acre as mentioned earlier and also for the fact that the cultivated area and cropped area in this wing of Pakistan are bound to increase in successive years, the scope of introducing mechanized farming in the country becomes enormously vast. Again, an urgent need of reducing the bullock population to release the land area from fodders, has been strongly felt in the country.

Type and size of tractors
Makewise number of tractors

| Make | Number of tractors |
|------------------|--------------------|
| Massey Ferguson | 7,599 |
| Fordsons | 2,432 |
| International | 1,806 |
| Byelarus | 1,558 |
| Adanjee Bentz. | 1,350 |
| John Decre Lanz | 1,309 |
| Zadrugar | 365 |
| Other wheel type | 704 |
| | 17,123 |
| Crauelers | 1,786 |
| | 18,909 |

Most of the wheel type tractors are in the range of 26 to 66 hp. The average engine hp is 48 and the average drawbar hp 39. The hp range of crawlers is 67 to 150.

Future policy

Govt. is very much conscious about the present situation and the need for an immediate farm mechanization. But due to the difficulties mentioned above, the pace of mechanization has been rather very negligible until the recent past. After that it took up some speed at least in West Pakistan where the number of tractors was about 8,000 in 1965 which is about 19,000 at present. In East Pakistan the number was about 750 and the present number is about 1,950, up to 1965, and there was no power tiller in the private sector in East Pakistan, whereas there are more than 2,000 of them at present in the private sector.

As has been discussed in this paper, the pace of industrialization has been much more rapid in West Pakistan causing, according to a very recent data, even some labor shortage during peak periods in the Agril. Sector due to out-flow of labor from farming to industry. This coupled with high degree of diversification of agril. of that wing and recent increase in intensity of cultivation, has greatly paved the way for more rapid mechanization in that wing of Pakistan. But in East Pakistan, the intensity of industrialization has been also very less in comparison and the smallness of average size of holding together with fragmentation and the topography of the land, have all come in the way of mechanization at least at that speed in West Pakistan. Moreover, even at the beginning after the creation of Pakistan, West Pakistan was fortunate to have an elaborate canal irrigation system and consequently a more sophisticated farming practices than East Pakistan.

However, very little progress in this respect was made in the country in over all, until the 1st Five Year Plan of 1955-60 when a sum of 44 million Rupees was provided for the plan period to foster farm mechanization in the country. The food and agril. commission of Pakistan (1960) among its "five Firsts" further emphasized and recommended and accelerated farm mechanization program for the country.

In view of the directive of president of Pakistan in 1961 to adopt mechanized farming in the country more enthusiastically, a high powered working party was formed which after much deliberation recommended mechanized farming through co-

operatives and block farming in the country immediately. Subsequently Govt. was up and doing to provide all sorts of facilities to the intending farmers going for mechanization.

The latest very important step taken by the Govt. in this respect is the decision to appoint very high powered-farm mechanization committees for both wings of Pakistan to investigate into the present condition through elaborate physical survey and to recommend to the Govt. about measures to be taken for the implementation of a practical mechanization-program in the country as soon as possible. The West Pakistan committee which was appointed in September, 1968 have already submitted their final report to the Govt. of Pakistan in March this year.

The East Pakistan committee has been appointed by the beginning of this year and is already in vigorous action to prepare the report.

It is hoped that after the finalization of these reports, a final shape about the future policy of Govt. regarding farm mechanization in the country will be attained and implementation work will be launched immediately.