OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

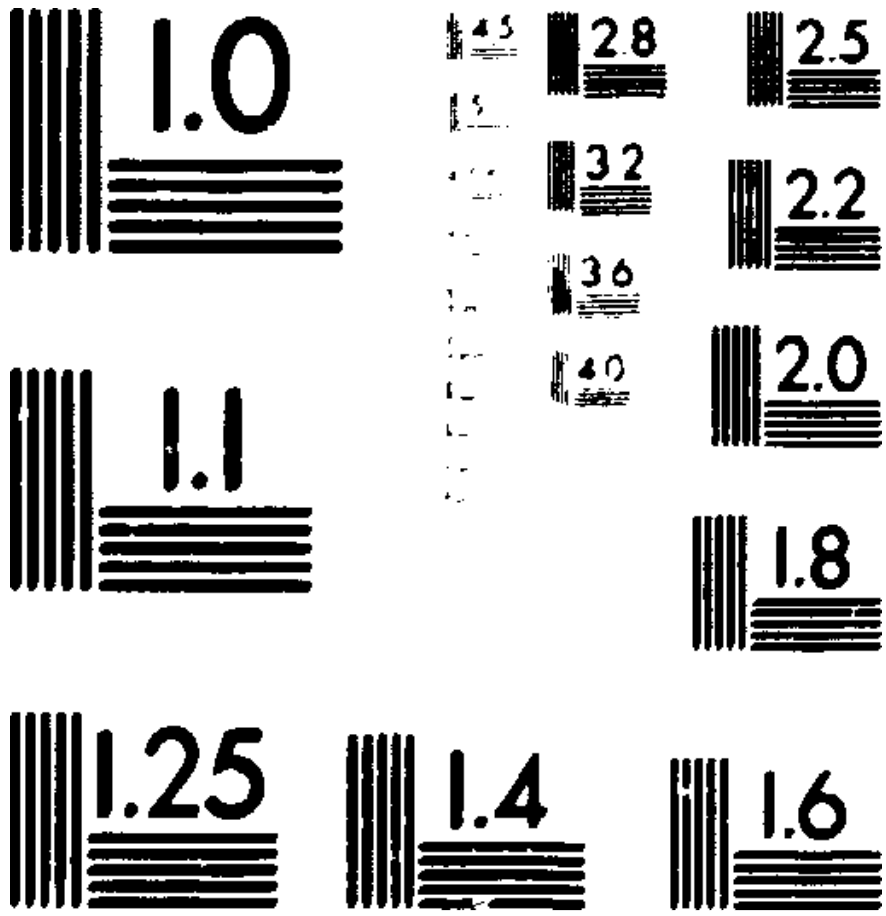
FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org



RESTRICTED

13707

DP/ID/SER.A/517
1 June 1984
ENGLISH

REGIONAL NETWORK FOR PRODUCTION, MARKETING
AND CONTROL OF PESTICIDES IN ASIA AND THE FAR EAST
DP/RAS/82/006

Pakistan.

Technical report: Consultation on research and development for pesticide production in Pakistan*

Prepared for the Government of Pakistan
by the United Nations Industrial Development Organization
acting as executing agency for the United Nations Development Programme

Based on the work of Karoly Szabo,
consultant on pesticide

United Nations Industrial Development Organization
Vienna

*This document has been reproduced without formal editing.

V.84-87047

Table of Contents

I. INTRODUCTION

The Government of Pakistan fully recognizes the importance of healthy and productive agriculture in the global development of the national economy and accordingly gives high priority to the agricultural sector in its development plan. This is understandable since agriculture is still the largest sector of the economy which provides about one third of the GDP and gives work and a living to about 57 percent of the national labour force. In addition, about one third of the foreign currency earnings derive from this sector. In spite of this the production level of agriculture is rahter low, even when compared to other countries in the region.

The reason for this goes back to inadequate physical inputs both in quantitative and qualitative terms. With the exception of an outstanding irrigation system extended practically to the entire Indus river basin, the use of fertilizer, pesticides and mechanical equipment is considered inadequate. The use of agro-pesticides in Pakistan began with a few hundred tons in the early 1950's. This figure passed 8000 tons/year by 1980. Government subsidies amounting from 50 to 57 percent of the total cost of pesticides and application equipment, and a very ambitious aerial application scheme implemented by the Government played a predominant role in this growth. However, not all went well with this sytem; storage facilities were inadequate, distribution was ineffective, application equipment substandard and scarce and the farmer, who had no chance to choose the pesticide he could have trusted, remained uninvolved and unconvinced of the importance of using pesticides. In 1980 the Government withdrew the subsidy on the sale of pesticides to farmers, which first resulted in a sharp drop in the use, however, during the subsequent years the sale of pesticides, handled entirely by the private sector, has been again steadily increasing and is expected to amount to Rs. 740/- million in 1984.

The fast increasing demand in pesticides, which with the exemption of a relatively small amount of DDT and BHC based insecticides manufactured locally, is basically satisfied by imports, alerted the Government to examine if local pesticide production could be expanded by reconstruction or restructuring present facilities, in order to provide a larger variety of products useful in agriculture and public health.

In order to support and secure a well planned and coordinated development of local pesticide industries it is also important to establish

or reinforce research and development organizations, institutions having a responsibility in production, use and control of pesticides.

The Pakistan Agricultural Research Council (PARC) seems to be well positioned to undertake the task of coordination in this complex matter. They already have an important coordinating role at the national level in the Regional Pesticides Development Network in Asia and the Far East (DP/RAS/82/006), a UNDP/UNIDO sponsored project, in which Pakistan participates. The subject consultant mission has been requested as part of the Regional Project Programme with the following terms of reference:

Title: Consultant on R & D for Pesticide Manufacture

Duration: One month

Duties:
1. Review the status of the pesticide industry in Pakistan
2. Study demand and supply in pesticides
3. Review pesticide research and development in the country relevant to pesticide industries.
4. Recommend possibility of local production of widely used pesticides.
5. Explore possibility of conversion of existing DDT/BHC plants to multi-purpose pesticides production units.
6. Any other items to be mutually agreed by the Government of Pakistan and the consultant concerning research and development on pesticide manufacture.

In the opinion of the writer the findings and recommendations of this mission on points 4 & 5 have to be followed up by appropriate techno-economic or feasibility studies before final conclusions could be reached or decisions made by the competent authorities. On reviewing the terms of reference of the mission in the Ministry of Agriculture, it has been decided that the report should touch upon all policy, technical and marketing matters, which directly affect, and potentially hinder, the development of the local pesticides formulation and production industries. It was also suggested that this report should be used as background paper for an inter-departmental consultation, including the Ministry of Agriculture, Finance, Sicence and Technology and Production as well as pesticides formulation and production industries, to be convened in the near future. This consultation should work out the guidelines for attending current government policies and regulations as well as commercial and field practices, considered counter-productive for the farmers and to the establishment, expansion and operations of domestic pesticide manufacturing and formulation industries.

II. GENERAL ECONOMIC CONSIDERATIONS

Pakistan, in its strugle to accelerate the economic development of the country and to narrow the gap with industrially developed countries, faces many handicaps such as a stratified traditional society, an insufficient level of literacy and a modestly effective agriculture, which is supposed to be the backbone of the economy. The Government has been well aware of these problems and since 1955, in all Five-Years Development Plans assigned the highest priority to strengthening the country's infrastructure of energy, dams, irrigations, electric power, transportation, communication and education. While high attention was given to industry, agriculture, particularly food production, was singled out as a vitally important branch of economy in the development of the country.

Pakistan's natural resources consist of its land, extensive reserved natural gas, some petroleum, rock salt, coal and iron ore. Agriculture is the most important contributor to the economy, mainly in the Indus river basin which is one of the largest irrigation systems in the world. It employs 57 percent of the population and provides 33 percent of the national income. Major crops are wheat, rice, cotton, maize, sugarcane, jute, gram and horticultural products. Self-sufficiency has been achieved in wheat and a substantial proportion of the rice grown is being exported. Similarly an increasing share of cotton grown and processed is exported, rice and cotton (raw and processed) being the top foreign exchange earners among the agriculture products. Of Pakistan's total area about one fourth is arable and cultivated, 14 percent of the total area, nearly 60 percent of the cultivated land is irrigated. About two-thirds of the irrigated area is in Punjab, the remaining third in Sind province. The per capita cultivated area is less than one acre and since population growth rate, particularly in the rural area, is still very high, may sink lower.

Twenty five of the farms are under 5 acre in size, 62 percent are 5-25 acres and 13 percent over 25 acres. Thus a large portion of farms are too small to obtain optimum benefits from modern inputs such as mechanization, fertilizer and pesticides, tools and equipments.

The Government drive to achieve full food self-sufficiency has already resulted in a 15 percent increase in the acreage of food crops. The cotton growing area also has grown by about one fourth during the last 10 to 15

years. Yields per acre of most major crops have shown in increase during this period but are not among the best ones among the developing countries of the region. (For some relevant indicative figures refer to Annexes 1, 2, and 3).

Industry: Particularly light industry, has grown rapidly in the 1960's, thus cotton textile production is the largest employer of labour. Industrial chemicals, fertilizer, cement production and petroleum refining have been also developed, accounting for about one fifth of Pakistan's GNP. The most important industrial chemicals, which could serve as raw materials or intermediates for the production of various pesticides include chlorine, caustic, sulfuric acid, oleum, hydrochloric acid, kerosene fractions, acetic acid, short chain alcohols, benzene, toluene and xylene. The latter being also an important solvent for liquid pesticide formulations. Inert minerals, useful as carriers and diluents in solid pesticide formulations, are also available in a good selection and quality.

Foreign Trade: Pakistan imports capital good for development efforts, industrial raw materials, consumer goods and some food products. Foreign trade policies have been gradually liberalized as the country consolidated its balance of payment, primarily through export earnings mentioned above and bilateral economic aid. As regards pesticide imports financial rules favour the import of finished products instead that of the raw materials needed in the local production and formulation of pesticides, thus providing no incentives for local industry, but rather constraints.

Labour Force: About one fourth of the labour force, an estimated total of twenty five million, is unemployed or under-employed. High illeteracy rate further aggravates the situations in the rural area where opportunities for non-farm occupations are scarce. All this, results in a substantial under-utilization of manpower resources. The development and utilization of Pakistan's vast human resources is one of the greatest challenges to the national leadership. An educational reform in 1972 and the subsequent nationalization of all educational institutions at primary, secondary and college level were steps taken by the Government in order to cope with this crucial problem. However, the drain of professionals and skilled workers, who seek employment in Arab countries or the West, causes shortages in these categories.

III. GOVERNMENT POLICIES RELEVANT TO THE DEVELOPMENT OF PESTICIDE INDUSTRIES

A. The Pesticide Legislation and its Enforcement:

1. Pakistan has established its Pesticides Registration system in 1971 by Ordinance No. 11/1971 which also regulated the import, manufacture, formulation, sale, distribution and use of pesticides. This Law has been supplemented by a statutory notification (SRO 1187 [I] 73) issued by the Ministry of Food Agriculture and Cooperatives in 1973, and amended by Ordinance No. XII of 1979.

The Law requires that in order to qualify for registration, candidate pesticides must be cleared by PARC's Federal Pesticide laboratory by analytically confirming the claims concerning chemical composition and physical properties made by the applicant. For the purpose of this clearance the Director of Federal Department of Plant Protection shall ask for larger samples for field trials to be conducted for two crop seasons (i.e. two years) by at least two Provincial Plant Protection Institutes in collaboration with the technical representatives of the applicant. The results of the field trials are submitted to a technical sub-committee headed by the Director of Federal Department of Plant Protection for evaluation, based on which the Agricultural Pesticides Technical Advisory committees (APTAC), the head of which is the Federal Secretary of Food and Agriculture, makes the final decision concerning the registration of a product. The whole process requires two to three years.

Since the Ordinance and the Rules came into effect, several experts, task forces, interest groups and agencies have scrutinized, and often criticized the registration procedure. Outside critics generally believe that they are too complicated and unnecessarily tedious (USAID study on Plant Protection in Turkey, Iran, Afghanistan and Pakistan, 1972, and ESCAP report on Basic Supply and Marketing Data on Agro-Pesticides in Pakistan, 1971). The USAID research team saw no value in committing valuable research talent to field testing of compounds with synonymous active ingredients (but different trade names) and suggested that mammalian toxicity, primarily acute toxicity should be given more weight in approving or not approving a pesticide. In view of the inadequate availability and use of protective clothing and masks specified in the statutory notification of 1973

for the application of pesticides (para W/18/2) and of limited research personnel resources at provincial level, these observations and suggestions seem to be very valid.

Representatives of the industries, in particular the local enterpreneurs both in the private and public sector, gave voice of dis-satisfaction with the registration procedure in connection with two points:

(a) Extensive field testing requirements for commodity pesticides already registered and used in the country under a diffirent trade name (see reference to USAID report) and

(b) Registration of pesticides by a brand name.

Objection to the tedious field testing requirement for commodity pesticides seems to be a legitimate complaint voiced by local industry, as no investor or enterpreneur could afford to erect manufacturing facilities, only to produce a representative sample for field testing and then keep his facilities and capital idle for two years (i.e. two crop seasons). This would be an economic nonsense. Long field trials would also necessitate employment of technical experts by the applicant to cooperate with the provincial research personnel in the organization and implementation of the field tests. This could easily amount to an additional cost of twenty to thirty thousand US dollars, further aggravating the position of a local applicant and leading to disinterest in manufacture. Obviously this situation is also against the interest of the national economy and requires rectifications. An accelerated registration process for locally produced commodity pesticides limited to chemical identification, aging, physical and laboratory biological tests would seem to be a reasonable basis for resolving this problem.

As for the registration under brand names, this is a universally accepted practice and in effect a tool for protection against adulteration and misuse of pesticides. However, it is also a common practice to show both in the registration document and on the label of the pesticide the common name of the active ingredient, not only the chemical composition, in order to give guidance to dealers and facilitate the choice by the users.

Only if these amendments are clearly stated in the Act of registration, it can be hoped that local investors would consider establishment of new pesticide production facilities. Local production of widely used commodity

pesticides meanwhile should lead to increased competition, suppression of prices and less dependence on supplies from foreign multinational companies.

2. A recent study on the implementation of Pesticide Legislation carried out by a committee of specialists under the directive of the Chairman of the PARC/ Secretary ARD/ also concluded that since the Ordinance and the Rules have been in operation for more than a decade, a revision based on past experience and developments mainly caused by the transfer of pesticides distribution and sales from public to private sector, would be timely and necessary.

Other points raised by the study relate to improving the administration of the pesticide legislation and the technical research facilities for biological efficacy, residue analysis, toxicology and environmental implications.

As regards the administration of Pesticide Legislation, one has to concur that in the present organizaitonal setup, the Deparmtent of Plant Protection has responsibility, both in administrative and professional sense, beyond their means. The operation of APTAC and its Technical Sub-Committee could also be improved by providing a broader technical base for and streamlining their operations to meet all requirements both in the extent of coverage and time efficiency of their work. In this respect creation of an independent Federal Agency or body under the Agricultural Research Division of the Ministry of Food, Agriculture and Cooperatives, which would have the sole authority in the administration of the Pesticide Legislation and would integrate all technical services needed in the enforcement of the legislation, would be a logical and practical step. However, inclusion of all toxicological and environmental studies in the programme of any such agency would again lead to stretching too thin their technical and human resources and cause inadequate performance of the institutions. Besides, toxicology studies would be justified only on new compounds and compositions which have not been exhaustively examined by other agencies, endowed with ample financial and technical means required for this type of work (e.g. multinationals, US, Europe, etc.). Use of foreign toxicology data is a common practice even in developed countries except for very special local conditions and requirements if such exist (e.g. extreme climatic, use pattern, socio-economic factors etc.).

3. On the other hand much more attention and effort seem to be justified in enforcing the Pesticide Law. The Ordinance and the Rules are comprehensive and well designed documents and devote great attention to the control of pesticides approved and marketed in the country, but in fact little or perhaps none of the relevant provisions are presently enforced or carried out. The establishment of an appropriate number (at least one in each province, perhaps two in Punjab) of quality control laboratories seems to be a minimum requirement. These laboratories should carry out continuous and routine random inspection and analysis of marketed pesticides first of all at distributors and dealers' level. According to one estimate, taking in consideration that some 200 formulations are registered which are being handled through five storage plants, twenty distributors and about 500 dealers, until they reach the farmer, for exerting an adequate control at all distribution levels about 24000 analyses would be required, or about one hundred samples a day. This divided among five quality control laboratories, would mean 20 to 30 samples per day, which should not be difficult to handle by relatively small teams of technicians. For sampling pesticides on the market, inspectors could be used as outlined in the Ordinance of 1971. However, it could be an economically better and more efficient approach to entrust the task of sampling to extension officers, who spend a substantial portion of their time on duty in the field.

4. The number of brands and formulations presently registered stands around 200, and as more are coming every year (Annex 4) it seems to be a legitimate question if the farmers do not get simply overwhelmed by the multitude of brand names and associated promotional activities. One way to minimise this danger would be to show the common name, not the chemical composition of the active ingredient, on the lable in bold printed letters as large and eye catching as those of the brand names, (apparently registration is already being done by common name, too).

5. Most of the agro pesticides being toxic material, their sales and handling should be only in the hands of qualified and licenced dealers. This could be achieved by organizing training courses for the dealers on a regional and mandatory basis followed by granting the licences which would clearly state the legal and moral obligations (code of conduct) of the dealers vis-a-vis the customers (farmers). Repeated offenses of this code should lead to the revocation of the licence. Pesticide

manufacturing and importing companies would be required to cover the cost of the above training courses. The principle of using only qualified and licenced dealers in the distribution of agro pesticides could be incorporated in the Ordinance and Rules.

6. Conditions permitting (i.e. if appropriate pilferage proof sealable containers in all required sizes would become available) the sale of agro pesticides from open containers should be forbidden with severe legal consequences such as withdrawal of dealers licence to reduce the danger of accidental poisoning and product adulteration.

B. Financial Policies

Current financial policies regulating the import of pesticides and other materials required for their manufacture such as adjuvants, solvents and carriers, containers and packaging materials are entirely counter-productive for the development of a local pesticides manufacturing industry in any form or stage.

In 1980 the Government stopped importing pesticides by Government tenders and since then imports are left to the private sector based on the recommendations of the Provincial Plant Protection authority. When the tender systems was abandoned, the import of pesticides and auxiliary materials has been regulated by the Ministry of Finance. According to these regulations which are very complex, finished products could be imported with a 10 percent duty while components of the finished pesticide products, such as technical active ingredients, needed in the local production, adjuvants, carriers, surfactants and packaging materials or containers carry a duty charge from 20 to 115 percent. Even local components of pesticides formulations, such as xylene, a solvent commonly used in liquid emulsifiable concentrates, is being taxed to the extent of 10 percent sale tax. The same solvent as a component of finished products is not taxed when imported in such forms.

The multi-national pesticide companies, who import an overwhelming proportion of the pesticides succeeded in their lobbying efforts to get the finished pesticide products exempted of all duties and taxes thus enlarging the gap in tax and duty charges between finished products and raw materials. As a result, a very large segment of the domestic formulation industry stopped operation because they could not keep up their competitiveness. Even those

multi-national companies which established formulation facilities in Pakistan are doing little if any local formulation for the very same reasons, although they may not admit it publicly.

These conditions created an almost monopolistic situation for the big international concerns, who can import products without substantial competition and set arbitrary sales prices. In fact many of the pesticides imported in Pakistan have sold at prices exceeding by 20-100 percent the world market prices or even prices set by the same companies in not too far away Asian Countries (Annex 5)

Local formulators trying to get a share of the market have to import the technical active ingredient, adjuvants and other auxiliary products, with duty and sales taxes levied on these products in the magnitude of an aggregate 30 percent. Furthermore, imported packaging materials (polyethlyene bags) and metal aluminium sheets or containers carry and agrregate 115 percent duty, sales and surcharge taxes, rendering local formulation operations nearly impossible.

Some local enterpreneurs would like to undertake not only the local formulation of pesticides, but also the production of some active ingredient. They are facing the same situation. On each intermediate, duties and taxes are levied which are practically prohibitive and result in stifling any local initiative.

Obviously this situation required urgent attention and rectification if the utilization of existing local facilities is to be saved and erection of additional production units is to be encouraged. It would be quite normal to reverse the present system and levy a duty on all imported finished products which are or could be formulated in the country, while exempting the local products of such charges.

A similar scheme could be applied to the manufacture of technical active materials. Formulators and distributors could be induced to use locally manufactured ingredients in their final products if such ingredients are a part of the formulated composition and domestically available. Protective tariff policy would be considered internationally acceptable in such cases. Presently, there are only two active ingredients locally produced or produceable, BHC and DDT. Imports of any combination containing

these ingredients should be discouraged by duty levied on such imports. The same tariff proteciton could be extended to any pesticide technical active ingredients manufactured domestically in the future.

The problem of mecal containers deserves an individual evaluation because liquid formulations requiring such packaging materials are highly popular in the country and probably account for more than 80 percent of the current consumption. Local formulators presently would have to use containers manufactured domestically by a semi automatic (semi-manual) process. A large portion of this production, put at about 30 to 50 percent, is defective and develops leakage during transportation or storage. This leads not only to substantial material losses, but opens an easy way for adulteration and for accidental poisoning.

Initiatives to obtain an import licence for an all automatic metal, preferably aluminium, bottle making machine have been blocked with the explanation that in the domestic production of containers utilization of manual labour to a potentially maximum extent is an imperative principle. These arguments leave out of consideration the loss of work opportunities of a several times larger work force in half a dozen of formulation plants, which cannot operate at capacity because of the poor quality and inadequate selection of the local containers. A reasonable solution to this problem should be found very urgently if a permanent or long lasting damage to the local pesticide formulation industry is to be avoided. The logical solution would be to authorize the import and installation of one or more modern, fully automatic aluminum bottle making machines and the duty and tax free import of an adequate amount and quality of aluminum sheet for local industries. Duty and tax exemptions are presently granted to metal and polyethylene sheets used for the local manufacture of agricultural implements, sprayers and fertilizer bags. Metal pesticide containers should be included in the same scheme.

IV. PESTICIDE DEMAND AND SUPPLY

There is no reliable information on the consumption of agro pesticides in Pakistan. thus it is practically impossible to define current or to project future demand. The situation is further complicated by the fact that imports and highly subsidized sales before 1980, were handled by Government

agencies (Department of Plant Protection and Department of Investment Promotion, and Supplies) and procurement figures could be misleading because:

a) large quantities of pesticides remained unsold

b) substantial losses occurred during transport and storage.

c) stocks which exceeded recommended shelflife, have been (or should have been) disposed of. For example in 1976, 14000 tons of pesticides were imported and according to some reports, stocks dating back 6-15 years are still around in some storage places.

Sales figures compiled since 1980, when Government subsidy stopped and sales were handed over to the private sector, are also meaningless because in the transition period sales have drastically dropped and have still not entirely recovered although the yearly growth rates were exceptionally high (30 to 110 percent), thus useless for establishing and plotting trends:

Year	Sales/million rupees	Increase % (approximate)
1980	100	
1981	250	150
1982	330	30
1983	570	80
1984	740	30
		(Forecast)

Statistics released annually by the government on "spray hectares" can be also misleading because they do not necessarily cover full season protection of the same given area. For instance one or two sprays in a cotton field may prove useless, the real requirement could be five to six applications.

Estimates based on crop areas are also unreliable because of socio-economic factors. Small farmers, who are not equipped either fianncially or technically to carry out chemical plant protection measures, are still engaged in cotton production, sometimes with disastrous results. Crop areas belonging to these farmers cannot be included in the demand column under present circumstances.

And finally consideration of farm sizes, in connection with crop areas, as a definite indicator of demand is not a reliable guideline because cultural

customs and processes vary widely in the country from one pocket of land to another. Cotton, the cash crop demanding the most extensive application of pesticides, primarily insecticides, is grown on about 1,900,000 ha. It is also believed to take about 90 percent of all insecticides sold in the country. Based on this, sales organizations estimate that presently one third of the cotton growing area gets only one treatment calculated on country-wide total acreage. However, demand cannot be put eighteen times (3 x 6 treatments) higher because of the above mentioned socio-economic and local conditions and circumstances.

Pesticide distributors are optimistic that the market growth will continue at a rather brisk rate (20-30 percent p.a.) for a number of years, but nobody volunteers or ventures to make a projection.

Beside cotton, rice, sugarcane, tobacco, fruits and vegetables, and maize represent significant current and potential markets for pesticides. Wheat, the largest crop in the country is just emerging as a market primarily for herbicides since human resources cannot be indefinitely stretched for hand weeding. In view of this it is possible that in five to ten years sales will double again. This looks also likely based on consumption figures in other countries in the region which are usually higher per crop area unit than in Pakistan. A potential surge in the use of herbicides could also substantially contribute to this process. According to estimates of local formulators herbicides may take 30 percent of the total pesticide market in three to seven years.

In the public health sector the control of the malaria vector represents a substantial insecticide requirement. DDT was used from 1960 to 1976/77 periodically alternated with BHC. Due to mosquito resistance to these products, malathion is being currently used at the tune of 5-600 t/year. However, malathion is more expensive and signs of incipient resistance against malathion have already appeared, on a trial bases mosaical spraying is carried out with propoxur, benthiocarb and landrin, all much more expensive than DDT or malathion. If malathion resistance continues to grow, substitution will represent a great problem according to WHO local officials. It is hoped that by then the resistance to DDT will subside making its use once again possible.

The supply of pesticides is secured to a large extent by imports. Except DDT and BHC, there are no commercial domestic manufacturing facilities. Conditions at Nowshera DDT plant have deteriorated to the point that it has lost its potential production capabilities except for formulating DDT 75 percent W.P. The Ittehad Pesticide Plant at Kala Shah Kaku (Lahore) is out of operation since February 1980 and both the BHC and DDT plants, with installed capacities of 1400 and 1300 t/year respectively, could be reactivated. These quantities could be readily consumed in the country, if marketed through an efficient distributor and dealers network with proper promotion.

On the other hand most of the larger multinational foreign pesticide companies are represented in Pakistan and have strong sales. Most of them import finished products by own local offices and seem to dominate the market. Since pesticides sales are much dependent on crop seasons credits, the capital strong multinationls enjoy an edge over their local competitors. Although most multinationals have local formulation capacities, either own facilities or through an agent (joint venture), outside granular and dust formulations, relatively modest portions of their sales are locally formulated for reasons given in chapter III. In 1982, 1104 tons of active ingredients were sold, in 1983 this figure rose to 1525 tons, an increase of about 40 percent. The sales value grew by 80 percent which can be explained by the introduction of several new pyrethroids, products of high unit price, but used at lower concentrations and dosages. Inflationary forces also played some role in this steep sales value increase. A common problem for all local formulators, be it associated with a multinational company or not, is the container. Hand made seams of metal containers often leak (up to 50%) causing considerable waste. Attempts are made to glue the seams that is supposed to hold tight under factory conditions, but may prove ineffective when it comes to transportation. It is highly recommendable, that the Government cooperates with pesticide formulators to find an economically acceptable quick solution to this problem.

In general it can be stated that the private import and distribution system is up to the task to provide adequate pesticide supplies for the agricutlrue, with the exception of some seasonal spot shortages. The companies also carry out an agressive sales policy providing crop-seasonal credit to farmers and technical advice to the dealers. They apparently meet their calculations partly because sale prices of pesticides in Pakistan seem

to be in many instances considerably higher than the world prices, or even prices in other countries of the region. Other tools to promote sales consist of giving generous commissions to the distributors and dealers.

Besides the bad quality containers which cause serious losses in liquid formulations very popular among farmers, dealers may represent another weak link in the chain of distribution of pesticides supplies. As mentioned before training and licencing may overcome this defficiency. Training costs could be carried or shared by industries.

V. THE PESTICIDE INDUSTRY IN PAKISTAN

A. Local Manufacture of Active Ingredients

There have been only two commercial scale pesticide active ingredient manufacturing plants in Pakistan. The Nowshera DDT Plant and Ittehad Pesticide in Kala Shah Kaku (Lahore), both belong to the Federal Chemical and Ceramics Corporation Limited (FCCCL), a holding company of Karachi.

Nowshera DDT Plant

It has been commissioned in 1954 with UNESCO assistance to provide DDT 75 percent WP for the malaria vector control, with a capacity of 600 t/year technical DDT. The plant had a monochlorbenzene (MCB), a chloral and a DDT (condensation) production unit and WP formulation facilities of 2500 t/year capacity. The entire production of the plant was procured and used for the malaria vector control campaign implemented by the Government. When in 1977 the use of DDT for this purpose stopped because resistance of mosquitoes developed, the company was left with substantial technical DDT stocks, of which 400 tons are still there. The plant as such is inoperational since 1978, some equipment (the chloral plant) is used for other production purposes such as $Al_2 (SO_4)_3$. The liquid formulation capacity was temporarily used for producing malathion 50 EC, until the US Aide programme stopped.

Since becoming idle the MCB plant has been stripped, the chloral making glass lined equipment is still in place and partly usable, the condensation unit requires substantial repairs.

As the company was exclusively working for the government anti-malaria campaign (public sector) it has never set up a marketing division or hired a marketing manager. This is one of the main reasons why the 400 t. technical

DDT is still in stock. Faint efforts have been made to sell this stock as 25 percent EC through a distributor with little success. One explanation could be insufficient promotion and unattractive return for the distributors deriving from low commission (8 percent) and low unit price (about 40 Rs/l). Obviously distributors and dealers push in the forefront products on which return is much greater, like a product which sells for 150 - 250 Rs. per litre possibly with a commission of 20 to 30 percent. The technical management of the plant is well qualified and would like to restart DDT production. However, this does not seem to be possible because:

a) monochlorbenzene, oleum and sulphuric acid would have to be transported to Nowshera from Lahore, a costly long haul;

b) in the present private marketing system Nowshera would not be equipped to compete because of constrains on promotional activities and structural weakness at this state owned company;

c) reconstruction of the remaining incomplete facilities would cost at least about 12 to 15 lakhs.

Instead consideration could be given to manufacture dichlorvos (2,2 - dichloroethenyl dimethyl phosphate) and trichlorofon (dimethyl 2,2,2, trichloro -1- hydroxy-ethyl phosphate), both direct derivatives of chloral, in the existing chloral making and chloral distillation facilities which are in working condition. The problem of marketing would still exist unless the technical materials or end-products were passed on to Ittehad Pesticides for marketing. A third possibility being considered by the Plant Management and FCCCL is a foreign offer to utilize the chloral plant for the production, basically formulation, of detergents working with imported technical concentrates. It would require a thorough techno-economic analysis to evaluate which of the three possibilities, including the production of aluminum sulphate, would be technically and economically best. The formulation facilities of Nowshera are uniquely suitable for the production of DDT 75 WP. Therefore, their preservation is important. They could be the key to exports to countries of the region where DDT is still used for mosquito control in this form, preferentially recommended by WHO. For a list of equipments available at Nowshera please refer to Annex 6.

A much more drastic, solution would be the privatization of the company, in other words selling the plant to a private interest.

Ittehad Pesticides (IP)

Ittehad Pesticides is on the same site with Ittehad Chemicals (IC), its history has much common with the Nowshera DDT plant. Its DDT production plant was commissioned in 1964 with an installed capacity of 1320 t/year. It started as a profitable operation. The production was based on chlorine coming from the electrolysis plant of IC, which did not have use for the 50 t/day chlorine, and the product was sold to the malaria control and to Government sponsored agro-pesticide programmes. The MCB unit's capacity is 8 t/day, but only 3 t/day have been required for DDT production. To make use of the large excess of chlorine, a BHC plant was erected and commissioned with Stauffer know-how, producing 1400 tons/year of a 23 percent gamma product, a uniquely good technical quality in worldwide relation.

In 1977 the use of DDT and BHC for mosquito control has been suspended, in 1978 the Government subsidized agro-pesticide procurement and distribution scheme started to phase out, in 1980 the Government subsidies stopped and the distribution and sales of pesticides were given to the private sector. This hit hard at IP who had only a scant marketing operation. Production in both plants stopped in February 1980 leaving IP with 1000 t. DDT and 1400 tons BHC in stock. However, no real marketing effort followed. First it was hoped that the National Fertilizer Corporation and National Fertilizer Marketing Limited would take over the marketing, but BHC/DDT proved to be too small for them to generate genuine interest. The bad publicity given to BHC/DDT, which bordered some times a hysteria, and the competition by the private sector proved to be disastrous in 1979/80. In 1980/81 a turnabout materialized through greater marketing efforts and inclusion of Zimeon, a Lahore private distribution company, in the scheme, resulting in three times better sales than in 1979/80. Sales have been continuously improving ever since. DDT is being sold to agriculture, mainly cotton growers as 25 percent EC in xylene solution and in combination with Zolone (14 and 27 percent EC) BHC as cotton dust and wettable powder, also in combination with Sevin (Sevidol, Annex 4). Finally the company finished 1983, after several years of losses, with a modest profit (Annex 7). Current BHC and DDT stocks amount to 400 t. each, and probably will be sold during 1984.

Since both plants were closed down in 1980 their reactivation will take some time and the repair may take six months and cost about Rs. 7 - 8,000,000. It would be important to maintain the continuity of the flow of DDT products

for agriculture, lest the farmers loose interest in using them. It would be therefore advisable that IP take over the stock of Nowshera when their own stock is exhausted to be able to keep up deliveries next year, which hopefully will increase beyond the amount of DDT in stock.

In view of the extensive cotton growing in Pakistan the future of the BHC/DDT plant seems to be safe. There is still quite a campaign behind the stages against these products but fortunately not as exaggerated and hysteric, as it was earlier. In this respect it is noteworthy that both in India and China DDT and BHC are used in the agriculture from 15 to 100 times higher rate. It could be also of interest to note that recent studies concluded that much of the DDT residues reported earlier, may have been erroneously attributed to DDT, since PCB's could not be distinguished from DDT by instruments available earlier. A recent study carried out in Taiwan also indicates that the 50 percent lifetime of DDT in soil under tropical conditions is only about 6 months, much shorter than under temperate climates. In view of this it would be advisable to start the reconditioning of these plants as soon as possible, beginning with immediate preventive maintenance works. (A recent statement of FAO on the use of DDT in agriculture is attached as Annex 11).

B. Local Formulations

On paper there are a dozen local formulation plants, but only nine seem to be active to a varying extent at the moment (Annex 8). For over a decade granular pesticides dominated the market in Pakistan. With the private sector operating the market the farmers' preference has been given more weight and EC's seem to have come up on the top of the contest, because they are easier to handle than WP's or granulars, particularly if the applicators are not of high quality. This is a strange situation, because still very little, perhaps not more than 1000 t/year EC is being locally formulated in Pakistan. The reason is high cost of components (solvents, active ingredient, adjuvants, etc.) because of duties and sales taxes and non-availability of good quality and satisfactory choice of containers. With these justifications most EC products are currently imported, although the domestic formulation capacity several times exceeds the current demand, (Annex 9). Practically no wettable powder is formulated presently, they are not popular with farmers and often plug-up the sprayer heads, repeated cleaning of which is a nuisance to the farmer. The main cause of this phenomenon can be found in the low quality of sprayers.

Granulars (Diazinon, Thimet, Disulfoton, Birlane, etc.) are still formulation to a large extent in the country using sand and brick-chips as a carrier and the coating method. Since granulars usually contain not more than 10 percent active ingredient, their import involving trans-continental transport would be very costly and could increase prices exorbitantly. Since the country is endowed with adequate granular carrier resources this formualtion activity is likely to continue strong, for a while. Many of the inert ingredients and some auxiliaries used in conventional formulations are available in the country. For details please refer to a report by Dr. S. Zafar Masud appended as Annex 9. Measures, primarily financial policy changes, that could revitalize the EC formulations industry in the country have been discussed under chapter III/B. It would consist of dropping sales tax and duties on imported components of pesticides formulations and the packaging materials needed, sales tax on xylene, a solvent produced by the National Refinery Limited, at Karachi, and taking appropriate steps to set up a local leak-proof container production line, using duty free metal sheet. Early corrective actions in these matters are highly desirable. In addition to the above conventional type of formulations, there are sporadic initiatives to introduce some new type of formulations such as flowable concentrates, imported and repacked locally for the time being (Farm chemicals 60 percent owned by Ciba Geigy).

Formulation capacities in all conventional types by far exceed the local requirements (Annex 9). Appropriate Government policy promoting the utilization of these capacities to the fulles possible extent would be required.

A rather unique type of activity is being initiated by a Karachi enterprise, A.G. Services and Supplies. It intends to set up jointly with Degesch a tabletting and packaging facility for aluminium phosphide with a capacity of 200 t/year of a 56 percent product. Present need is about 150 t/year thus the new facilities would amply cover domestic requirements. However the success of this undertaking would much depend on the same financial policy prerequisites enumerated above (primarily duty free packaging material). This operation could result in 50 percent savings in packaging materials and a better supply of the fumigating agent not only for Government, but also for private stocks of food grains.

C. Imports

Except BHC and DDT based insecticides all other pesticides have been imported to Pakistan. Before 1980 all foreign procurements were made on a tender basis by the Department of Investment Promotion at the recommendation of the Department of Plant Protection. The quantities, compositions or brands were all decided at the administrative level, the consumer (farmer) has been completely left out of the process of selection and decision.

Since 1980 the imports are made by pesticide manufacturing and distribution companies based on certificates of recommendation from the Provincial Governments. At the beginning imports of finished products carried a 10 percent duty, however, this has been removed at the lobbying of the Pakistan Agricultural Pesticide Association, leaving duties and taxes levied only on unfinished products, components of pesticide formulations thus giving an edge to importers over the local formulators. This situation led to a substantial shrinkage of the local formulation industry and a strong upswing for the import of finished pesticides. Thus the pesticide consumption figures given in Chapter IV, refer with few exceptions (mainly DDT and BHC based products and granular formulations) to imported pesticides.

A detailed list of pesticide imports and sales for 1982 is attached as Annex 10. On examining the list it becomes evident that insecticides dominate the market and within this group the synthetic pyrethroids are being promoted and sold at a fast increasing rate. Annex 5 gives the local unit price of 20 pesticides selected by RENPAF a UNIDO sponsored regional pesticides project for a comparative evaluation of marketing practices in the region. This would indicate that prices in Pakistan are generally higher than in most of the other countries in the region.

Imports in 1983 have reached US $50 million and next year's figure is expected to rise to about US $60 million. This represents a level of consumption where serious consideration should be given to the expansion of the local manufacture and formulation of pesticides.

However, present import regulations are counter-productive to domestic formulation or manufacture of pesticides. Appropriate tariff measures could provide incentive to formulators and protect local pesticide industries. As concerns compositions and formulations containing active ingredients

manufactured in the country, presently DDT and BHC, imports of formulations containing these active ingredient may be made contingent on the full utilization of the local products on a priority basis.

D. Distribution and Marketing:

Prior to 1980 procurement of pesticides was done by the Federal Government. The distribution and marketing has been organized by the Department of Plant Protection in different ways in the provinces. In Punjab and Sind provinces the private sector has been involved in the distribution. In NWFP and Baluchistan distribution has been kept a Government monopoly. This system, with direct Government involvement and direction proved to be ineffective, costly and wasteful mainly because distributors having no real stake in the sales, acted in a bureaucratic way which resulted in large unsold stocks of pesticides, transport damages and losses and overaged, deteriorated products.

In 1980 distribution and marketing of pesticides was handed over to the private sector. Apart from the initial difficulties in the reorganization of the market, this decision proved to be fortunate, in as much as it initiated a more effective distribution and marketing system. Distributors were allowed to import all pesticides they chose to, if recommended by one or more provincial plant protection authorities. New pesticides were registered and a larger variety and selection was offered to the farmers. Furthermore farmers were given a chance to purchase and use the pesticide of their own choice and so they became more involved in the process of marketing.

The major markets for pesticides, in particular insecticides, are cotton, rice and sugarcane. Maize, fruits, vegetable and tobacco are potentially also important outlets for pesticides, particularly in the northern parts of the country. However, presently the market is dominated by the pesticides requirements of cotton. Accordingly 90 percent of the pesticides sold are insecticides and cotton accounts for 80 percent of the total sales volume. In spite of this impressive consumption of pesticides in cotton production, some limitations and weeknesses of the system are evident. Only about one third of the cotton area gets treated probably not with the required number of treatments. Larger cotton farmers are believed to be more regular users of insecticides. Small farmers may not even realize the full advantage of the application of pesticides and many of

them are lacking proper application equipment. Since cotton production is an age-old tradition among small farmers it would seem worthwhile to encourage volantary cooperation of small farmers in farmers associations or cooperatives by providing meaningful incentives, like interest free long-term credits for equipment and other physical inputs. In view of social attitudes common in Pakistan, a drive for such a cooperative scheme should avoid any appearance of achieving it by imposition or coercion. If progress could be made in this direction, the use of physical farm inputs, including pesticides, may substantially increase, and marketing efforts could become more successful.

The strongest promotional tool in, and at the core of the current distribution and marketing system, is the crop season credit, provided by the distributors to the farmers. Without it, in the opinion of many distributors, the whole market would collapse. This is also a determining factor in terms of competition among distributors. The capital strong distributors, such as multinationals clearly have an advantage over less endowed competitors which are mainly the local enterprises. Government owned operations like Nowshera and IP have experienced particular difficulty in adjusting themselves to the new situations, because of the inherent bureaucracy in those companies. Despite the apparent disparities, there seems to be no other effective alternative system on hand, and local entrepreneurs and Government owned companies would have to adjust themselves to the situation. The management of Government companies ought to realize that investments in the promotion of their products is indispensible, even if its initial consequences appear to be negative in financial terms.

Mention was already made of the important role the dealers play in the marketing system. Countrywide, there are about 500 pesticide dealers. However, only about half of them are considered active and effective. With the high rate of illeteracy, the small farmer is almost entirely at the grace of the dealer (and the extension service) when he seeks a pesticide providing the best protection against ravaging pests decimating his crop. Dearlers are of course guided by profit motives in their operation and this could lead to unhealthy distortions in the market. Selling high-cost products carrying premium commission is not in the interest of the farmer or the country. Full control to avoid this phenomenon is not possible. However, giving a basic training to the dealers to understand the weight and consequences of their conduct and licensing them, which could be revoked

if serious and recurring malpractice is noticed, should mitigate this problem.

Upgrading the extension service could also significantly contribute to the control of the problem and improve the assistance provided to the farmers. Only well trained extension officers, who are constantly in the field, can give the guidance required by the farmer, and, time allowing, check routinly on the activities of dealers by spot visits and intimate contact with their customers, the farmer.

E. Quality Control

Distributors are not known to carry out any quality control of their products in the marketing chain. Whenever, an expiry date is shown on the lable it should be distributors'/dealers' responsibility to remove the product from the market. Otherwise it would be left to the network of provincial government quality control laboratories (as proposed under para III/A/3) to continuously check the quality of the products, while offered for sale.

VI. REVIEW OF PESTICIEE RESEARCH AND EVELOPMENT IN PAKISTAN

i) Agricultural Research Institutions

Most of the research work done at agricultural institutions relate to the application of pesticides, testing efficacy on different pests and making recommendations on their use. The coordinating agency is the Pakistan Agricultrual Research Council (PARC). The Central organization is the Federal Pesticides Research Laboratory, Karachi. For its organization please refer to the Chart (Annex 12). It has a wide ranging programme including examination and analysis of pesticide samples submitted for registration, aging tests, residue analysis on plants and in soil, bioassays related to insect resistance, in other words, mainly testing activities. R & D projects are under considerations such as the use of vegetable oils for pesticide formulations and effect of containers made of different metal sheets on pesticides and their shelflife. While these are important enough subjects to study, they have more of a commercial than scientific or use relevance thus they would fit in the R & D programme of industries and any conclusive result would benefit first of all them.

Neither the multinational importers nor the local formulators conduct any R & D activity specifically directed to local problems, for instance

to develop new formulations or combinations specially suitable to combat the pest population in an integrated way under Pakistani conditions or investigating products and combinations that would permit the reduction of the number of treatments required. It is suggested that the Pesticides Laboratory fill this gap by concentrating on this type of research work. A comprehensive research programme should be designed, which in addition to the aspects already mentioned could also encompass work on carriers and auxiliary products (e.g. synthetic silica). This would require laboratory equipment which is lacking presently. Hopefully, this can be acquired through bilateral aid or UNDP tehcnical assistance and consequently an appropriate operation could be set up in the new quarters of the Pesticides Laboratory to become available soon. Abroad training for staff to undertake formulation research, would be also essential.

Other major agricultural institutions connected with pesticide work are the Punjab Agricultural Research Institute at Faisalabad and the Cotton Research Institute at Multan. They run field efficacy tests with candidate pesticides and could combine forces with the Pesticide Laboratory when the phase of field testing is reached. Any results of these efforts that represent commercially exploitable values and are potentially beneficial for the agriculture and national economy could be transferred to public sector industries or licensed to private companies for production and marketing.

ii) Synthesis and Process Research

Pesticide manufacturing industries do not conduct any synthesis or process research. Know-how and processes in use for the manufacture of BHC and DDT were acquired from outside sources. There are no plans to embark on R & D work, nor staff or equipment required for such work are available.

The Pakistan Council of Scientific and Industrial Research, PCSIR, Karachi has a research programme dealing with pesticide projects called Pesticides, optimizing the process and production of:

a) Dipterex
b) Malathion
c) Diazinon
d) Diazomet

There was no clear indication on what basis these products have been singled out for development work. No inter-departmental coordination takes place with the Ministry of Agriculture or Ministry of Industry in establishing the researh objectives, which are not clearly defined. Apparently research ideas are ad-hoc submitted to the Ministry of Science and Technology for approval, which seems to be almost automatic, regardless if the expected product will be marketable and useful or not. The research ideas seem to be inspired by interest in the subject on the part of a public or private organization but do not contain an understanding or agreement for the financial support of the research work, nor represent any obligation or guarantees to share the cost with a potential user and beneficiary of results. This explains why practically none of the research efforts until now would qualify as a success and were utilized by industry.

The example of the malathion project could shed some light on the complications that one may encounter operating under these conditions. A process study for the manufacture of malathion was undertaken by PCSIR on the instigation of a private company, who showed sincere interest in setting up a production plant. The process study and optimization tests on 10 kg batches reached a point that larger pilot facilities were needed to scale it up to at least 100 kg. batches. The facilities were not there, and the potential client rescinded on his original intention. He interpreted that the registration process would require producing a representative commercial scale sample just for the registration process which would go on as long as two crop seasons or two years, according to the provisions of the Ordinance. He did not want to invest and keep his money tied up for two years, so he abandoned the idea.

Similar cases could be avoided only if interested parties, including supervisory agencies reach an agreement preferably in writing on all facts of the project implementation and the relevant cost sharing before PCSIR embarks on pesticide development projects.

Other pesticide works being carried on at PCSIR are as follows:

a. Extraction of natural products (juices) from babul, mazri, tea fluff and neem leaves which are believed to have nematocidal activity. The leaves of mazri, a palm like bush, are processed into a natural fiber which can substitute jute to some extent, the juice of the leaves, a by-product exhibits nematocidal activity.

b. Separation of components of the neem plant that have insecticidal activity as fumigants.

c. Production of zinc and aluminum phosphide, fumigant insecticides of commercial value.

PCSIR is a multi-disciplinary organization active in chemistry and applied biology and as such well qualified for pesticide research. A cooperation between PCSIR and PARC could be also envisaged when it comes to large scale field tests. However, the critical part of their operation is the mechanism by which the research objectives will be identified and achieving the structuring of a solid, preferably contractual, cooperation and coordination with other Government agencies through the Ministry of Science and Technology.

A short visit to H.E.J. Research Institute of Chemistry demonstrated the very high scientific and technical capabilities of this institution. They would be able to handle any organic chemical research project but their interest is on the theoretical side. Reproductive process work on known products, e.g. insecticides, would not appeal to them unless tied to some potential for substantial innovation. The supervisory staff has also strong background in natural products.

As regards the problems that the local industry currently faces, it would seem to be a good and rewarding process development work for PCSIR to take up the preparation of lindane, or at least a BHC highly enriched in gamma isomer, which could help Ittehad to market an environmentally safer product. The technical BHC produced at Ittehad is of a uniquely high quality (23% gamma isomer), so further purification should not pose any great problem.

Also the optimization of the recovery of nicotine from waste tobacco, if this raw material is in sufficiently large quantities available could be a commercially valuable undertaking, the product being a highly effective insecticide with no residual activity and in short supply worldwide, thus with good export potentials. It is understood that PCSIR Lahore has conducted a feasibility study on this subject in the past. It could be reactivated.

iii. Formulation Research:

As reported there is no activity whatsoever in this field in Pakistan. It has been suggested in paragraph VI/i that this responsibility could be assigned to the Federal Pesticide Research Laboratory, Karachi if an appropriate framework, equipment and trained personnel can be provided.

VII. CONVERSION OF EXISTING BHC/DDT PLANTS TO MULTI PRODUCTION UNITS

This problem has been the subject of discussions between UNIDO and Pakistani authorities for many years. The adverse publicity of chlorinated insecticides and the drastic changes in the marketing system, as well as the appearance of resistance in mosquitoes, created a very difficult situation for these industries. They stopped production several years ago and were struggling to sell their stocks. Meanwhile the physical condition of the idled plants has deteriorated to a variable but overall considerable degree.

In Nowshera this process led to the dismantling of the monochlorobenzene unit, to switching the chloral unit to the production of $Al_2(SO_4)_3$ and substantial damages in the condensation unit. At the moment the chloral plant is the only intact unit, which alone does not justify a reconstruction of the DDT plant. Instead it could be further used for the production of chloral and some organophosphorus derivatives of chloral, namely dichlorovos and trichlorfon, that are valuable insecticides of low toxicity. However, it is possible that the conversion of the facilities and organizaiton of the marketing would have a better chance under a flexible private management. Anyhow, any new programme would have to start with a techno-economic study relevant to any decision on the subject. Serious damage occured also at Ittehad DDT and BHC plants during these years. To avoid further deterioration, the urgent authorization and implementation of preventive maintenance measures is required.

The worst being over, Ittehad should prepare for the reactivation of their plants, since outlets for agricultural application are improving and all basic equipments and raw materials are in place. Repair cost is estimated Rs. 800,000. In view of this, there seems to be no good reason to think of the conversion of the plants. Concerning the medium term future, it would seem advisable to investigate the possibility of further refining

the technical BHC, produced in a uniquely good quality at Ittehad, into lindane or at least a much higher gamma content technical product, to obtain a safer and more environmentally friendly product, which should be also more readily accepted by the market.

VIII. POSSIBILITIES TO EXPAND LOCAL PESTICIDE PRODUCTION

a) Formulation Industry:

All traditional formulations (EC, G, D, WP, S) are produced in Pakistan, available plant capacity exceeding the requirements several times.

EC formulations are very popular because of the case of application. However tin cans, the usual packaging material for EC's, are of low quality and cause a lot of problems.

There are new types of formulations which resemble the EC's in the case of handling but do not apply aromatic organic solvents as a diluent e.g. flowable concentrates, flowable powders etc. Flowable concentrates are a fine dispersion of an active ingredient in an aqueous medium, their production is not very complicated, and being aqueous dispersions, they can be filled into plastic containers or bottles. Primarily water insoluble solids are suitable for this type of formulation, which is also very economic. Development of locally produceable flowable concentrates therefore seems to be an attractive objective.

b) Technical Pesticides:

i) Nowshera plant

On discussing the Nowshera DDT plant, reference was made to the possibility of using the chloral plant, the only unit which is in working condition, for the manufacture of dichlorvos and trichlorofon. Both compounds are organo-phosphorus insecticide based on chloral as an intermediate, registered and currently imported in Pakistan. A techno-economic assessment of the potential output of the existing facilities should be made in relation to the domestic demand. Very little, if any, addition and further investment would be required to the existing facilities to accomodate the processing steps involved in the production of the above two low toxicity organophosphates.

ii) Ittehad Pesticide:

The continued production of BHC and DDT, the availability or raw materials (N_aOH, Cl_2 sulfuric acid, oleum etc.) and possibility for easy expansion makes Ittehad a potential base for pesticide production in Pakistan. The desirability to process the technical BHC into a refined product has already been discussed. The capacity of the DDT plant seems to be adequate for the medium term, however, times may come when consideration should be given to the expansion of the production facilities.

Expansion in the production of other pesticides should start with the evaluation of market potentials and proceed with an aim at a balanced product line accomodating the national economic interest to a maximum degree. Insecticides, fungicides, herbicides and miticides could be considered for future development.

a) In any new insecticide facility, a certain degree of flexibility should be built in, so that at least 2-3 products could be produced alternatively. At first assessment, two families of organophosphate insecticides appear attractive.

1) $[(MeO)_2$ PSSH]	2) $[(MeO)_2$ PSCL]
Dimethoate	Methyl parathion
Malathion	Fenitrothion
Ethion	Fenthion
Phenthoate	

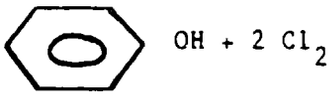
Each facility utilizes an organophosphorus intermediate of its own. Family one derives from dialkyldithiophosphoric acids, family two from dimethylphorochlorodothioate. The other reaction partner is different for each product, not only each family. Both groups of products are extensively used in the country, they are of moderate toxicity and free of patent protection, falling into the commodity class of pesticides. The selection of one of the product families over the other for production at Ittehad can be reliably achieved only by conducting a prefeasibility study on the subject.

b) Besides organophosphorus insecticides, which are highly attractive candidates for local manufacture because of their popularity and usefulness in controlling insect pests, another gruop of pesticides into which the expansion of Ittehad would be natural are chlorinated herbicides. It is estimated that with a DDT/BHC production at full blast, Ittehad will still have some 30 t/day chlorine available for other uses.

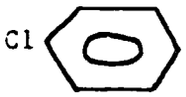
The simplest and widely applicable and therefore a very attractive product group would be the chlorinated phenoxy herbicides, the best known member being 2,4-D. Both reaction partners used for the synthesis of 2,4-D are chlorinated products, thus well fitting in Ittehad's programme.

$CH_3\ COOH$ + $Cl_2\ CH_2Cl\ COOH$ + HCl

Acetic acid — monochloroacetic acid



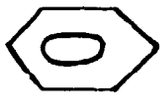
OH + 2 Cl_2



Cl

OH + HCl

Phenol — dichlorophenol



Cl

OH + $ClCH_2COOH$ NaOH

Cl

OCH_2COOH + NaCl

2,4-D

For the production of one ton of 2,4-D nearly the same amount (0.960 t) chlorine is used. While today the demand in 2,4-D and related compounds is relatively modest, the potential use of it or its derivatives (esters) is enormous, primarily in wheat and rice fields, but also in other cereals such as maize and barley. According to some private estimates, herbicides shall account for one third of the total pesticide usage by 1992. Other estimates believe this could happen within three years. Presently the share of herbicides in the pesticide market in Pakistan is only about five percent. The initiation of a feasibility study on this subject seems to be well justified and timely.

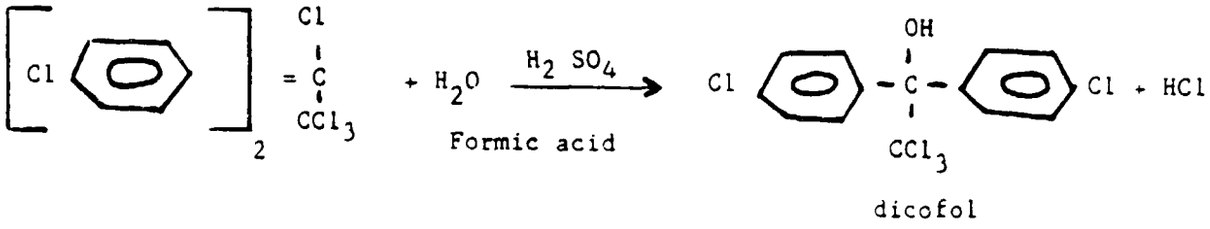
c) To continue the diversification process, a production unit for copperoxychloride, a broad spectrum fungicide, could be the third expansion target. Copperoxychloride is made from scrap copper by one of the following methods;

1. Scrap copper is suspended in a NaCl + $CuCl_2$ solution, mixture is kept vigorously agitated and, in the presence of a heavy metal catalyst, oxygen on air is blown into the reaction mixture. The complex reaction leading to the formation of copperoxychloride takes place on the surface of the copper particles, from where by constant agitation, the copperoxychloride is continuously removed in the form of a fine powder.

2. Equally simple is the chemical method, in which scrap copper is dissolved in HCl to give Cu Cl_2 which is precipitated by NaOh to give copperoxychloride.

d) Although the demand for a miticide alone is rather modest in the country, miticide - insecticide combinations are widely used in cotton. Dicofol is a typical miticide and can be made from DDT.

DDT is further chlorinated to give an intermediate which can be hydrolized in the presence of sulfuric acid and formic acid to give dicofol.



dicofol

The above considered pesticides can be characterized by simple production processes, absence of patent protection, low mammalian toxicity (with the exception of the monocrotophos family) and potentially good size markets. Most of the products discussed would require the use of such raw materials as chlorine, sulfuric acid, caustic, acetic acid, all locally available. In conclusion it would have to be stressed that for a more thorough evaluation of projects aiming at the

production of one or more pesticides discussed in this report, a feasibility study would have to be carried out in order to facilitate a judicious decision on any expansion and investment at the plants of FCCCL or private sector.

IX. CONCLUSIONS AND RECOMMENDATIONS

1. The Ordinance of 1971 and the Rules of 1973 do not differentiate between new products and commodity products already in use in the country, as concerns the registration process. This has inhibitive effects on developing new formulations particularly suitable for local conditions, and on investments in local manufacturing facilities. The amendment of the above laws to officially guarantee an accelerated registration process - not longer than three months - for commodity products is recommended. This shortened procedure could be limited to chemical indentification and physical, bioactivity and accelerated aging tests.

2. Labels usually emphasize brand names, common names and chemical compositions, if shown, are not conspicuous. This deprives the dealers and farmers from an easy and quick way to identify brands with their needs. It is recommended that printing the common names, not the chemical composition, next to the brand name, be made legally mandatory.

3. There are substantiated indications that sometimes dealers recommend, and farmers use pesticides not best suitable against the pests in question. In some instance one wrong choice could lead to the loss of the crop. To reduce this risk, dealers should be trained and licenced and the extension service further strengthened.

4. The provisions of the Ordinance concerning quality control in the network of distribution and sales are currently not implemented and enforced. The establishment of regional quality control laboratories, equipped and staffed properly for their function, is needed.

5. Current financial policies concerning duties and taxes levied on raw materials, active and inert ingredients, solvents, surfactants and other auxiliary products needed in the local formulation and manufacture of pesticides, are completely counterproductive and paralyse all initiatives for local production. The early abolishment of these financial

constraints on the development of local pesticide industries should be considered first priority.

6. The responsibility for the implementation and enforcement of the Ordinance and Rules is divided among several agencies. The full co-ordination of their activites is a difficult task. The establishment of a competent pesticide authority with sole responsibility for implementing the pesticide legislation should be considered.

7. The farmers prefer EC formulations because of the case of their application. Most EC formulations require metal containers. While locally made containers are of low quality, develop leakage and their compulsory use causes huge losses, all initiatives to import and install automatic aluminum bottle making machines and applications for duty and tax free import of metal sheet for such production has been repeatedly blocked by Government authorities. An urgent solution of this problem in a satisfactory fashion for local producers, seems to be imperative.

8. Plant protection efforts and practices do not take full advantage either of the locally produced DDT and BHC, two insecticides with broad activity spectrum and low mammalian toxicity or of the local formulations. Use of such products should be encouraged and increased by establishing tariff protection for pesticide products and ingredients locally available and extending their legal scope of application.

9. DDT and BHC manufacturers failed to make a vigorous campaign and effort to commercially exploit their capacities. The expansion of their distributor and dealer network, stepped-up promotional activities and expanded registration, including potential new combinations, are recommended for achieving this end.

10. No research and development work is being currently done on pesticide formulations in Pakistan, although formulation determines, in most cases, the suitability of a product for use under local conditions. Initiation of an appropriate research and development programme at the Federal Pesticide Research Laboratory is highly desirable and strongly recommended.

11. There is no coordination between Government agencies and laboratories involved and interested in the development of pesticides. It would seem necessary to find ways for such coordination both at the working level (PARC, PCSIR, and HEJ Institute of Chemistry) and administrative level (Ministries of Agriculture, Science and Technology, Industry and Production), in order to reinforce these efforts and enhance the practical application of the research results.

12. DDT and BHC based and locally manufactured pesticides recently have recovered some ground formerly lost in the market. To further this process special attention is to be given to a continuous and adequate supply of such products in order to be able to hold to the established customers even if production has to temporarily use imported active materials. A timely warning about depletion of current stocks and early implementation of required plant reactivation works at Ittehad Pesticides should mitigate this problem.

13. Both Ittehad Pesticides (FCCCL) and private companies expressed interest in the manufacture of a number of organo-phosphorus commodity insecticides. It is recommended that decision on this subject and selection of such products be based on a detailed feasibility assessment.

14. There are chemical raw materials in Pakistan, sometimes available in large excess, that could be grainfully used in the production of additional chlorinated pesticides. Products such as phenoxy herbicides, copperoxychloride (fungicide) and dicofol (miticide) offer a unique opportunity for product diversification and a fuller utilization of raw materials available at Ittehad Pesticides. The techno-economic evaluation of these opportunities by FCCCL is recommended.

ANNEX I

NUMBER OF FARMS, FARM AREA & CULTIVATED AREA—PUNJAB PROVINCE

Size of Farm (acres)	Farm		Farm area		Cultivated area	
	Number	%age	Acres	%age	Acress	%age
All farms	23,82,348	100	3,20,44,663	*	2,78,92,566	*
Government farm	110	*	94,002	*	38,189	*
Private farms—Total	23,82,238	100	3,19,50,661	100	2,78,54,377	100
under 1.0	93,877	4	45,411	*	42,356	*
1.0 to under 2.5	2,10,617	9	3,39,043	1	3,32,858	1
2.5 to under 5.0	68,314	13	11,27,033	3	10,77,508	4
5.0 to under 7.5	3,62,471	15	21,61,248	7	20,77,838	7
7.5 to under 12.5	5,64,009	24	54,57,796	17	52,26,413	19
12.5 to under 25.0	5,49,515	23	89,49,082	28	83,17,898	30
25.0 to under 50.0	2,10,032	9	66,30,073	21	58,36,914	21
50.0 to under 150.0	65,804	3	46,77,150	15	37,69,690	14
150.0 and above	7,661	*	25,63,825	8	11,82,902	4

* Percentage negligible

Source : Preliminary Report, Pakistan Census of Agriculture, 1972.

Annex 2

RESOURCE BASE - THE PUNJAB PROVINCE

POPULATION (in millions)—Including Federal Capital Territory.

1972	= 37.61
1961	= 25.58
1951	= 20.63

LAND UTILIZATION—1971-72 (million acress)

Geographical area	= 50.95
Total area reported	= 44.88
Forest area	= 1.05
Not available for cultivation	= 7.00
Uncultivated land	= 6.56
Cultivated area	= 27.27
Current fallow	= 2.76
Net area sown	= 24.51
Area sown more than once	= 3.99
Total cropped area (col. 9+10)	= 28.50

AREA IRRIGATED BY DIFFERENT SOURCES—1970-71

Total cultivated	= 27.16
Total irrigated	= 21.86
Canals—Government	= 14.62
Private	= 0.02
Tubewells	= 5.44
Wells	= 1.56
Tanks	= 0.02
Others	= 0.20

Source : Yearbook of Agriculture Statistics 1972-73, Government of Pakistan, Ministry of Food & Agriculture, January, 1974.

Annex 3

Agricultural statistics of Pakistan, 1980
Government of Pakistan, Ministry of Food,
Agriculture and Cooperatives.

Crop	Area in 000 ha		Production 000 t		x bales (b)
	1978/79	1979/80	1978/79	1979 / 1980	
Wheat	6687	6911	9950	10805	
Rice	2025	2034	3272	3215	
Maize	650	701	798	875	
Sugarcane	572	718	27325	27497	
Cotton	1891	2081	2662	4096	b
Jute	1603	2107	8148	11260	b
Tobacco	47,7	49,9	68,1	77,8	
Mung	65,9	69,0	29,9	32,7	
Pulses	31,8	29,5	16.2	15.2	

Annex 4.

AGRICULTURAL PESTICIDES REGISTERED

Common name	Brand(s) Registered	Formula-tions	Holders of registration certificate
1	2	3	4
ACARICIDES:			
Binapacryl.	Morocide	60 WP	M/s.Hoechst Pharma. Co., Limited.
Chlorobenzilate	Akar	50 EC	M/s. Ciba-Geigy (Pak.) Limited.
Cyhexatin.	Plictron	50WP	M/s. Dow Chemicals Pacific Limited.
Dicofol.	Kelthane.	42EC & 18.5EC	M/s. Rhom & Has Asia Inc.
Ethion.	Ethion	46.5EC	M/s. FMC Corporation.
Propergite.	Omite	57EC	M/s. PAFCO Limited.
Tetradifon.	Tedion V-18	7.52EC	M/s. Agro Chemicals
FUNGICIDES:			
Benomyl.	Benlate	50WP	M/s. R.B. Avari & Co.
Captan.	Captan.	50,75 & 80 WP	M/s. Jaffer Brothers Limited.
	Orthocide	75 SP	M/s. R.B. Avari & Co.
Carboxin + Thiram	Vitavax-200	37.5 + 37.5 WP	M/s. PAFCO Limited.
Chlorothalonil	Daconil	75 W	M/s. Nichimen Co.Ltd.
Coperoxinate	Quinolate	15	M/s Agro Chemicals.
Copper oxychloride	Cobox	50 WP	M/s. Agricides Ltd.
	Cupravit	50 WP	M/s. Chemdyes(Pak.)Ltd.
	Pol-Kupritox	50 WP	M/s. Shanimpiex Corp.
Cuprous oxide	Perenox	50	M/s. ICI (Pak.) Ltd.
Ethoxyethyl Mercuryhydroxide.	Antimucin	4	M/s. Sandoz (Pak.)Ltd.
Fentinacetate	Brestan	60 WP	M/s. Hoechst Pharma. (Pak.) Limited.
Kasugamycin	Kasumin	2	M/s. Agril. Chem.& Dyestuffs Limited.

1	2	3	4
Mancozeb	Mithane M-45	80 WP	M/s. Rhom & Hass Asia Inc.
Manzeb + Zineb	Liromanzeb	80 WP	M/s. Ciba-Geigy (Pak.) Limited.
Methoxyethyl Mercurychloride	Agallol Forte	6	M/s. Chemdyes (Pak.)Ltd
	Arctan-6	8.8	M/s. ICI (Pak.) Ltd.
Metiram	Polyram combi	80 WP	M/s. BASF (Pak.) Ltd.
Quinomethionate	Morestan	25 WP	M/s. Chemdyes (Pak,)Ltd
Propineb.	Antracol	80 WP	M/s. Chemdyes(Pak.)Ltd
Pthalide	Rabcide.	30 WP	M/s. Nichimen(Corp.Ltd.
Pyrazophos	Afugan	30 EC	M/s. Hoechst Pharmaceuticals Pakistan Ltd.
Thiobendazole	Tecto	40 F & 80 SP	M/s. Merck Sharp & Dho
Thiophanate Methyl.	Topsin	70 WP & 40 ULV	M/s. Nichimen Corp.Ltd.
Triforine	Saprol	19EC	M/s. Jaffar Brothers Ltd
Tridimefon	Bayleton	25 EC	M/s. Chemdyes Pak. Ltd
HERBICIDES:			
Ametryne + Atrazine.	Gesapex combi	80 WP	M/s. Ciba-Geigy(Pak)Ltd
Atrazine + Metolachlor	Primextra	500 FW	M/s. Ciba-Geigy(Pak.)Ltd
Benthiocarb.	Saturn	6 G & 10 G.	M/s. Nichimen Corp Ltd.
Bromoxynil + MCPA.	Buctril-M	40 EC	M/s. May & Baker Ltd.
Butachlor	Machete	60 EC & 5 G.	M/s. Chemdyes(Pak.)Ltd
Chlorotoluron + MCPA	Dicuran MA	60 WP	M/s. Ciba-Geigy(Pak.)Ltd
Dicamba.	Banvel	40..EC	M/s. Velsicol Chemicals Corporation.
Dalapon.	Dowpon-M	72.5+12.0	M/s. Dow-Chemicals and Pacific.
Dimethametryn+ Pinprophos	Avirosan	3.3 G	M/s. Ciba-Geigy(Pak.)Ltd

1	2	3	4
Diuron	Karmex	80 WP	M/s. R.B. Avari & Co.Ltd.
Isoproturon	Arelon	75 WP	M/s. Hoechst Pharmaceuticals. Paksitan Ltd.
Methabenzthiazuron	Tribunil	70 WP	M/s. Chemdyes (Pak.) Ltd.
Metoxuron	Dosanex	80 WP	M/s. Sandoz (Pak.) Ltd.
Paraquat	Gramoxone	20	M/s. ICI.(Pak.) Ltd.
Pendimathalin	Stomp	330 E	M/s. Cyanamid (Pak.) Ltd.
Propanil.	STAM F-34	25 EC & 36 EC	M/s. Rhom & Hass Asia Inc.
	Surcopur	250 EC & 360 EC.	M/s. Chemdyes (Pak.)Ltd.
2.4-D Butyl-ester	Esteron	76 BE	M/s. Dow Chemicals Pacific Limited.
2,4-D Dimethylamine	DMA-6	69..	M/s. Dow Chemicals Pacific Limited.
2. 4-D Sodium Salt.	Pol-Pielck	92 WP	M/s. Shanipex Corp.
Trifluralin + 2,4-D.	Treflan-R	10 Spreadable 20 EC & ٢.15 G.	M/s. Elanco International
INSECTICIDES:			
Acephata	Orthene	40 EC & 75 SP.	M/s. P.B. Avari & Co.
Aldicarb	Temik	10G	M/s. National Carbon.
Amiraz.	Mitac	20 EC	M/s. Boots Co.(Pak)Ltd.
Azinphosmethyl.	Gusathion	20 EC	M/s. Chemdyes (Pak.) Ltd.
Bacillus Thuringiensis	Bactospeine	16000WP 6000WP 500 G.	M/s. Agro Chemicals Ltd.
	Thuricide HP	16000WP	M/s. Sandoz(Pak.) Ltd.
BHC	BHC	12.5 WP 5 & 10 DP 6,8,10, G, & 4 EC.	M/s. Ittehad Pesticides
Bromophos	Nexion	25 EC 35 ULV	M/s. Jaffer Bros. Ltd.
Bromophos ethyl.	Nexagan	80 EC & 125 ULV	M/s. Jaffar Bros. Ltd.

Carbaryl	Sevin	10G,20G 10D & 85SP & 100.	M/s. National Carbon
Carbaryl + Gamma BHC	Sevidol	4:4 & 8:8G	M/s. National Insecticides
Carbofuran	Furadan	3G &10G	M/s. FMC Corporation
	Curaterr	3G	M/s. Chemdyes(Pak.)Ltd.
Cartap	Padan	10G & 4G	M.s. Nichimen(Corp;)Ltd.
Chlorfenvinphos	Birlane	10G & 24 EC.	Pak. Burmah Shell. Ltd.
Chlorpyrophos	Lorsban	40EC & 5G & 50ULV	M/s. Dow Chemicals Pacific Limited.
Chlorthiophos	Celathion	50EC, 100 ULV	M/s. Jaffer Bros. Ltd.
Chlorinated wax.	Ostico	90 Grease	M/s. ICI(Pak.) Ltd.
Cypermethrin	Ripcord.	10EC	M/s. Pak. Burmah Shell Ltd
	Cymbush	10EC	M/s. ICI (Pak) Ltd.
	Arrivo	10 EC	M/s. FMC Corporation
	Ripcord	2%ULV	M/s. Pakistan burmah Shell Ltd.
Chlorpyrifosmethyl	Reldan	25EC	M/s. Dow Chemicals & Pacif
Cypermethrin + Profenofos	Polytrin-C	440EC	M/s. Ciba-Geigy(Pak.) Ltd.
Cotton Dust	Cotton Dust	3:5:40	M/s. Ittehad Pesticides.
Cyanofenfos	Surecide	2EC	M/s. Agril. Chemical Dyestuffs Limited.
Cyfluthrin	Baythroid	050 SL	M/s. Chemdyes (Pak.) Ltd.
Decamethrin	Decis	2.5 EC 0.5 ULV	M/s. Hoechst Pharma. Co. Limited.
DDT	DDT	25EC,50 & 75 WP, & 10 DP.	M/s.Ittehad Pesticides
	DDT	25,50WP 75 WP 10D & 25EC.	M/s. Nowshera DDT Factory
Diazinon	Basudin	500EC 60EC,10G, 14G & 15G, 90SCO	M/s. Ciba-Geigy(Pak.) Ltd
	Diazinon	60EC,10G 14G & 80 ULV	M/s. EPAIDCO Limited

	2	3	4
	Diazinon	60EC,5G	M/s. Agro Chemicals Ltd.
Dibrom.	Naled	E	M/s. R.B.Avari & ColLtd.
Dichlorovos	Nogos	50 & 100 EC	M/s. Ciba-Geigy(Pak.)Ltd.
	Dedevap	50,100EC	M/s. Chemdyes (Pak.)Ltd.
	Phosvit.	100 EC	M.s. Nichimen Corptd.
	Vapona	100WSC	M/s. Pak. Burmah Shell Ltd.
	DDVP	50EC	M/s. Jaffer Bros. Ltd.
Dicrotophos	Bidrin	86WSC	M/s. Pak. Burmah Shall.Ltd
	Carbicron	100 & 50	M/s. Ciba-Geigy(Pak.)Ltd.
Dieldrin	Dieldrin	20EC	M/s. Pak. Burmah Shell
Dimethoate	Cygon	200E, 400E.	M/s. Cyanamid(Pak.)Ltd.
	Perfekthion	40EC	M/s. BASF(Pak.)Ltd.
	Rogor	40 EC, 65ULV	M/s. Alintco Ltd.
	Roxion	40 EC. 65 ULV	M/s. Jaffer Bros. Ltd.
Disulfoton	Disyston	10G	M/s. Chemdyes(Pak.)Ltd.
	Solvirex	10G	M/s. Sandoz(Pak)Ltd.
Endosulfan	Thiodan	35EC.5G & 25ULV	M/s. Hoechst Pharmaceu tical Ltd.
Endrin	Endrin	20EC	M/s. Pak. Burmah Shell Ltd.
	Endrin	20EC	M/s. Velsicol Chemical Ltd.
	Endrin	19.5EC	M/s. Agro Chemicals Ltd.
Estrimfos	Ekamet	50EC	M/s. Sandoz (Pak.) Ltd.
Fenitrothion	Agrothion	50EC & 98 ULV	M/s. ICI(Pak.) Ltd.
	Folithion	50EC & 98 ULV	M/s. Chemdyes(Pak.)Ltd.
	Novathion	98ULV & 50EC.	M/s. Consolidated Chemical Corporation

1	2	3	4
	Sumithion	50EC & 98 ULV	M/s. Agril. Chemicals & Dyestuffs Limited.
Fenthion	Lebaycid	50EC, 1000ULV, 12000G/L ULV,5G & 10G.	M/s.Chemdyes(Pak.)Ltd.
Fenvalerate	Sumicidin	20EC	M/s. Agril. Chemicals & Dyestuffs Limited.
Formothion	Anthio	25EC & 35ULV	M/s. Sandoz (Pak.)Ltd.
Fenvalerate	Sumicidin	2.5ULV	M/s. Agricultural Chemical & Dyestufs.
Heptachlor	Heptachlor	32EC	M/s. Veisicol Chemical Corporation.
Isothioate	Hosdon	.G	M/s. R.B. Avari & Co.Ltd.
Isoxathion	Karphos	50EC	M/s. Jaffer Bros. Ltd.
Malathion	Emmatos	57EC & 95 ULV	M/s. Alintco Limited
	Fyfanon	57EC, 95 ULV	M/s. Consolidated Chemical Corporation
	Malathion	57EC, 50WP & 95 ULV	M/s. Cyanamid(Pak.)Ltd.
	Malathion	57 EC	M/s. Agro Chemicals Ltd.
	MLT	57EC & ,5ULV	M/s. Agril.Chemicals & Dyestuffs Limited.
Mephospholan	Cytrolane	3G	M/s. Cyanamid(Pak.)Ltd.
Methamidophos	Tamaron	600LC	M/s. Chemdyes (Pak.)Ltd.
	Monitor	600EC.	M/s. R.B. Avari & Co.Ltd.
Methidathion.	Supracide	40EC	M/s. Ciba-Geigy(Pak.)Ltd.
Methomyl	Lannate	90WSP	M/s. R.B.Avari & Co.Ltd.
Mevinphos	Gesfid	24EC	M/s. Jaffer Bros. Ltd.
	Phosdrin	24EC	M/s. Pak. Burmah Shell.Ltd.
MIPC	Mipcin	50WP	M/s. Nichimen Corptd.

1	2	3	4
Mineral oil	Triona	80EC	M/s. Pak. Burmah Shell
	Winter oil	7EC	M/s.ICI (Pak.)Ltd.
	Albolineum	80%WE	M/s. ICI(Pak.)Ltd.
Monocrotophos	Azodrin	40WSC	M/s.Pak.Burmah Shell.
	Nuvacron	40WSC	M/s. Ciba-Geigy(Pak.)Ltd.
Monocrot phos + DDT	Nuvacron combi	300EC	M/s.Ciba-Geigy(Pak.)Ltd.
Oxydemeton Methyl.	Metasystox	25EC,& 50 ULV	M/s. Chemdyes(Pak.)Ltd.
Parathion Methyl	Folidol-M.	50EC	M/s. Chemdyes(Pak.)Ltd.
	Methyl-Parathion	50EC	M/s. Consolidated Chemical Corporation.
	Methyl-Parathion.	50EC	M/s. Agro-Chemical Ltd.
Permethrin	Ambush	25Ec	M.s. ICI(Pak.)Ltd.
	Permasect	25EC	M/s. R.B. Avari & Co.Ltd.
	Pounce.	3.2 EC	M/s. FMC Corporation Ltd.
	Talcord	25EC.	M/s. Pak. Burmah Shell.
Phenthoate	Cidial	92ULV, 50EC & 5G	M/s. Alintco Limited
	Elsan	92ULV, 50EC & 5G	M/s. EPAIDCO Limited
Phosalone	Zolone	35EC	M/s. May & Baker Ltd.
	Zolone liquid		
Phosalone DDT	Zolone DT	41.2EC	M/s. May & Baker Limited
Phosmet	Imidan	50WP	M/s. Agri-Gold Corp.
Phosphamidon	Dimecron	100SCO	M/s. Ciba-Geigy(Pak.)Ltd.
Phorate	Thimet	5,10G	M/s. Cyanamid(Pak.)Ltd.
Phorate	Thimet	5,10G	M/s. Cyanamid(Pak.)Ltd.
Pirimicarb	Pirimor	50DP	M/s.ICI (Pak.) Ltd.
Pirimiphos Methyl	Actellic	50EC	M/s. ICI.(Pak). Ltd.
Polychlorinated Petroleum hydrocarbon.	Petkolin	100EC	PCSIR, Karachi

1	2	3	4
Profenofos	Curacron	500EC	M/s. Ciba-Geigy(Pak.)Ltd.
Pyrethrin + Piperonyl butoxide	Detmolin	Detmolin-P	M/s. Albert & Co. Rawalpindi.
Pyrifendathion	Ofunack	2% Dust	M/s. Agricultural Chemical & Dyestuffs.
Pyrifendathion	Ofunack	40EC	M/s. Agril.Chem.&Dyestuffs.
Quinalphos	Edalux	30ULV, 25EC & 5G.	M/s. Sandoz (Pak.)Ltd.
Tetrachlorvinfos	Gardona	24EC & 10G.	M/s. Pak. Burmah Shell
Thiocyclam-Hydro_enoxalate	Evisect.	5G	M/s. Sandoz(Pak.)Ltd.
Thiofanox	Dacamox	5G	M/s. Jaffer Bros.Ltd.
Toxaphene	Toxaphene	90	M/s.Agro Chemical Ltd.
Triazophos	Hostathion	40EC & 25 ULV	M/s. Hoechst Pharmaceuticals
Trichlorofon	Dipterex	50EX & 80 SP.	M/s. Chemdyes(Pak.)Ltd.
Vamidothion	Kilval	40WSC	M/s.May & Baker Ltd.
NEMATOCIDES:			
Dichloropropane + Dichloropropene	DD Soil fumigant	75 & 90EC	M/s. Pak. Burmah Shell
RODENTICIDES:			
Brodifacoum	Klerat	0.1% Powder concentrate	M/s.ICI (Pak.)Ltd.
Coumatetralyl	Racumin	i) 0.75 powder ii) Ready made bait 0.375% iii) 0.8 liquid mixture	M/s. Chemdyes(Pak.)Ltd
Sodium cyanide	Cymag	40WP	M/s. ICI (Pak.)Ltd.
Zinc Phosphide	Zinc Phosphide	80 Powder	M/s. Jaffer Bros. Ltd.
	Zinc Phosphide	80 Powder	M/s. Agro Chemicals Ltd.
	Zinc Phosphide	90-95 Powder	M/s. International Enterprises.
	Zinc Phosphide	80 Powder	M/s. Agricides Limited
	Zinc Phosphide	80 Powder	M/s. Arrow Trading Co.

1	2	3	4
FUMIGANTS:			
Aluminium Phosphide	Celphos	Tablets	M/s. Vinex Trading Co.Ltd.
	Detia Gas EX-B	Bags	M/s. Alintco Limited.
	Delicia Gastoxin	Tablets	M/s. Dawood Corp. Ltd.
	Detia Gas Ex-T.	Tablets	M/s. Alintco Limited
	Phostoxin-R	Pellets/ Prepac	M/s. A.G. Services & Supp
	Phostoxin-R	Bags.	M/s. A.G.Services& Supplie
Methyl Bromide	Dowfume MC-2	98	M/s. Dow Chemical & Pacifi
	Terabol.	98	M/s. A.G.Services & Suppl
	Bromomethene	98	M/s. Albert & Co. Ltd.
	Saibrom	98	M/s. Progressive Associates
	Methyl Bromide	98 & 100	M/s. Paradise Impex Corpor ation
	Methybron	98	M/s. Agricultural Chemicals and Dyestuffs Limited.
	Pestmaster	98	Velsicol Chemical Corp.
EDCT	Dowfume	75	M/s. Dow Chemical & Pacifi

Annex 5

RETAIL PRICES OF SELECTED PESTICIDE IN PAKISTAN AS OF JANUARY 1, 1982.

	PRODUCT	PACKING	RETAIL PRICE PER UNIT IN USED
1.	CARBOFURAN 3% GR	15 kg	1.35/kg
2.	MONOCROTOPMOS 40% S	1 litre	13.85/litre
3.	CARBARYL 85% WDP	1 kg	7.54/kg
4.	ENDOSULPHAN 35% EC	1 litre	7.92/litre
5.	FENITROTHION 50% EC	1 litre	9.62/litre
6.	PARAQUAT 2% S	5 litres	8.00/litre
7.	MANCOZEB 5	1 kg	4.46/kg
8.	DIAZINON 60% EC	10 litres	10.77/litre
9.	PHENTHOATE 50% EC	10 litres	10.15/litre
10.	DIMETHOATE 30% EC	1 litre	9.62/litre
11.	2,4-D ESTER		
12.	CAPTAN 0% WDP	1 kg	5.54/kg
13.	MALATHION 57% EC	1 litre	5.00/litre
14.	DIAZINON 01% GR	25 kg	1.54/kg
15.	METHYL PARATHION 50 EC	20 litres	4.23/litre
16.	ZINC PHOSPHIDE	½ kg	6.92/kg
17.	CYPERMETHRIN	1 litre	38.38/litre
18.	FENTHION		

QUOTED PACK SIZE NEAREST TO EITHER 1 KILOGRAM OR 1 LITER.

Annex 6

NOELMERA D.D.T. FACTORY, NOELMERA

SECTION-WISE PLANT EQUIPMENT INSTALLED

Sl.No.	Description	Quantity
1.	DDT Section:	
	Pfaudler Glasslined Vessel serviceable	5 Nos.
	" " " unserviceable	2 Nos.
	Batch Bank. " "	8 "
	DDT Wash Tank " " "	2 "
	Condensation Vessel " "	1 No.
	MCB stripping Vessel " "	1 "
	MCB stripping column " "	1 "
	Steel Vessel " "	1 "
	HCl Holding Tank. " "	2 "
	HCl Absorber " "	2 "
	Vent scrubber " "	1 No.
	Crude DDT holding Tank " "	1 "
	Alcoholate Storage Tank " "	1 "
	MCB holding Tank " "	2 Nos
	Tail Gas Scrubber " "	2 "
	Heat Exchanger " "	6 "
	MCB Condenser Cascade Type. " "	1 No.
	Pumps. " "	6 Nos.
	Hot Room with casting pan, steam coil heater & Exhaust Fan	1 No.
2.	Formulation Section:	
	Micronizer 24 "	2 Nos.
	Micronizer 4"	1 No.
	Micropulverizer complete	1 "
	Air Compressor complete with accessories	3 Nos.
	Ammonia Compressor with accessories	3 Nos.
	Dynaclone compete with accessories	2 Nos.
	Ribbon Mixer	3 Nos
	Hydraulic Jolter with accessories	1 No.
	S.S. Saw tooth Crusher	1 "
	Pin Mill	1 "
	Weighing Scales(Avery)	3 Nos.
	Hopper	5 Nos.
3.	MISCELLANEOUS TANKS, COOLERS & PUMPS:	
	Oleum Storage Tank	2 Nos
	MCB Storage Tank	1 No
	Benzene Storage Tank	3 Nos
	Alcohol Storage Tank	1 Nos
	Spent Acid Storage Tank	1 No.
	Furnace Oil sotrage tank concrete	1 "
	Oleum Pump	2 Nos
	Alcohol Pump	2 "
	MCB Pump	1 No
4.	COOLING TOWER:	
	Water circulation Pump	1 No
	Water cooling Pump	2 Nos
	Cooling Tower Fan & Motor	1 No.
	Fire Fighting Pump & Motor	1 "
5	CHLORINE SECTION:	
	Chlorine Evaporator	5 Nos
	Scrubber Seperator	1 Nos
	Platform type weigh bridges	2 Nos
6.	BOILER HOUSE.	
	AMES Steam Boiler compete with Accessories	1 No
7.	PLANT POWER STATION.	
	Transformers	4 Nos
	Control Board	1 Nos.

Annex 7

ITTEHAD PESTICIDES
KALA SHAH KAKU

STATEMENT SHOWING ANNUAL SALES VOLUME OF PESTICIDES, 1980-83:

FINANCIAL YEAR ENDED JUNE 30	1980	1981	1982	1983	1983-84 6 months
	Quantity	Quantity	Quantity	Quantity	Quantity
SALES VOLUME					
BHC Technical	67	7	58	55	15
DDT 10% Dust	-	9	14	30	15
DDT 5% Dust	-	-	6	4	1
Cotton Dust	-	-	3	84849	107257
Zulone DE 41.25% EC.	58819	5582	7548	2282	-
DDT 25% EC.	-	-	5000	199077	324600
BHC 12.5% W.P.	14936	60012	148666	16	12
BHC 10% Dust	47	11	29	16	111
BHC 5% Dust	162	119	168	211	177
MCB(Intermediate)	-	-	-	10	12
Liquid Bleach	-	2	-	-	-

Annex 8

Local Formulation Industry

Plant	Formulation capacity * T/ million liter/year Granules	Dust/WP	EC
1. Agro-Chemicals, Ltd Karachi, Sind	3000	6000	3.4
2. Farm Chemicals/ Ciba Geighy) Karachi Sind.	5000	-	N.A
3. Gramlaso Ltd ((Swami tomo) Karachi Sind	6000	-	-
4. National Insecticides Karachi, Sind.	2500	5500	-
5. Pakistan Burmah Shell Ltd	-	-	6.8
6. Agricidies, Ltd, Karachi Sind.	1500	-	3.0
7. Nowshera DDT Plant NWFP.	-	2500	N.A
8. Ihelad Pesticides Kala Shah Kaku, Punjab.	-	7500	2.1
9. Sandoz Pak. Ltd Karachi Sind.	1500	-	3.0
10. Pesticide formulation, Lahore, Punjab.	3000	-	6.8
11. National Cehmicals Lahore, Punjab.	500	75000	
12. Hoechst Chemicals (in the planning phase)	*	*	*

* Capacities calculated on an 8 hrs his shift and 272 days/year.

.....

Annex 9

REPORT ON FORMULATION OF PESTICIDES IN PAKISTAN.

By

S. Zafar Masud

There are at least seven well established pesticide formulation plants in the country but none of them is being utilized to its full installed capacity. It is evident from the following data for the years 1981 and 1982 obtained from the concerned organizations:-

Name of the formulation plant	Sanctioned capacity per annum	Actual production per annum	
		1981	1982
1. Farm Chemicals Limited (Ciba Geigy)	Granules-3000 tons/ shift -6000 tons/ 2 shifts.	850	750
	Liquids-2 million Lit. in one shift only	120,000 liters	260,000 liters.
2. Pakistan Burmah Shell.	Liquid-1.8 million Lit. only	100,000 Litres	150,000 Litres.
3. Agricides Ltd.	Granules-1500 metric tons	Nil	Nil
	Liquid-3 million Lits.	Nil	165,000 litres.
4. Agro-chemicals Limited.			
a) Karachi Plants	Granules-3500 metric tons/shift	100	425
	WP/Dust-2500 metric tons/shift	Nil	Nil
	Liquids-2.5 million litres	65,700 litres	95,625 litres
b) Aimnabad Gujranwala	Granules-3500 metric tons	Nil	Nil
5. National Insecticides Limited. (Jaffar Bros.)	Granules/Dust 4000 metric tons	414	371
6. Granulars Ltd.	3600 tons/single shift.	Nil	Nil
7. A.M. Gill Ltd., (Sargodha)	Granules-3200 metric tons only.	Nil	Nil

The picture is bleak. The reason is quite obvious lack of encouragement from the government. Most of the pesticides are being imported in the finished/formulated form due to the fact that agricultural pesticides are exempt from sales tax/custom duty etc. but if different ingredients/auxilliaries of pesticides are imported for formulation in Pakistan, the same are subjected to sales tax/ custom duty etc. This enhances the cost of the finished product enormously which is beyond the reach of the ordinary farmer.

As for the local availability of various active ingredients, inerts and auxilliar-ies for pesticides formulation, detailed position is as under:-

1. Pesticides Technical grade:

The-re are only two pesticides manufacturing plants in Pakistan namely DDT factory at Noshera and Kalashah Kaku (Ittehad Pesticides Limited). Owing to limited consumption of these chlorinated insecticides in the agriculture/health sector, both the plants have been lying idle for several years.

2. Solvents/carrier for liquid formulations:

a) Xylene:

Being the cheapest, it is mostly used as a diluent in liquid formulation particularly emulsifiable concentrates. It is being produced as a bye - product of petroleum industry by National Refinery Limited and marketed by Pakistan State Oil. All requirements of the formulation industry can be met locally.

b) Cyclohexanone:

It is used to a small extent for some water soluble concentrates. We have to rely on its import only. Large scale manufacture of this solvent would not be economically feasible at present.

c) Vegetable Oils:

They are being used in some countries as inert carriers in liquid pesticide formulation. They are better than other diluents in the sense that they prolong the residual life of the insecticide. The possibility of using vegetable oils, eg., rapeseed oil, mustard oil, cotton seed oil, turpentine oil, caster oil etc. in pesticide formulations by the local industry can also be explored in Pakistan.

3. Surfactants/Emulsifires:

A blend of non-ionic and anionic emulsifiers is used. Very small quantity of the emulsifier is usually needed in the formulation of emulsifiable concentrates. One particular blend will not be suitable for all types of pesticides. Different pesticides require different types of emulsifiers. Due to this reason, local manufacture of the product would not be economically feasible. It will have to be imported at present.

4. Adjuvents/Stabilizers:

a) Epichlorohydrin:

Due to its carcinogenic effect, it is no longer being used by Ciba-Geigy and other leading manufacturers. It has been substituted by Reo-Plast-39.

b) Reo-Plast-39:

c) Hexa-methylene tetramine (HMT).

d) Diethylene glycol.

These are items of import at present. Since only a small quantity of stablizer is needed, it should not be produced locally.

5. Anti-Caking agents/Dry lubricants:

These are often used in dust and WP formulations. Usually, four types are used, namely:-

a) Graphite
b) Soapstone
c) Talcs
d) Certain metal stearates.

The first three of the above mentioned materials are available in different parts of Pakistan in abundance. As regards (d) factual position could not be ascertained.

6. Protective colloids/coating materials:

These are used for granular formulations to reduce hazards (for highly toxic pesticides) e.g.

a) Polyvinyl pyrolidone
b) Sodium Carboxy-methyl cellulose
c) Methyl cellulose
d) Collagen

None of them is manufactured locally and its commercial production at present will also not be economically feasible.

7. Stickers:

a) Polyethylene polysulphide (PEPS).
b) Collagen.

These are often used for solid formulations and not presently produced locally.

8. Anti-dusting agent:

Glycerine:

It is used to a small extent for certain types of solid formulations. Glycerine is locally obtained as a bye-product of soap industry and the quantity produced is sufficient to meet country's demands.

9. Anti-foaming agents:

These are used for emulsifiable concentrates and other liquid formulations. Two types are generally used:

a) Liquid silicone

b) Aliphatic alcohol of 8-10 carbon atoms.

These are items of import only.

10. Carrier/Diluents/inerts for dusts/WPS & granules:

a) Lime stone:

It occurs in considerable quantities in various parts of Pakistan and is suitable for several insecticidesformulations.

b)Diatomaceous (Fuller's) earth:

It occurs in various parts of Sind and the Punjab. It is highly sorptive in nature and is very suitable as a diluent/carrier in pesticide formulations.

c) Bentonite:

It is available in large quantities in Azad Kashmir and the Punjab and is a suitable carrier for pesticide formulations.

d) Kaolinite (China Clasy):

It occurs in large quantities is Swat and salt ranges of the Punjab. Besides, it also occurs to some extent in Sind and NWFP. It has a good sorptive capacity and is a suitable diluent for insecticides.

e) Gypsum:

It is available in various parts of Pakistan in large quantities. It is already being exploited by the pesticide formulation industry in some formulations.

f) Talc (Soapstone):

Small deposits of this material are available in various places in NWFP and Baluchistan. Although suitable as a diluent, its high market prices may not be economical for use with pesticides.

g) Silica:

It is available in abundance in different parts of Pakistan and is already being exploited by the pesticide industry in the formulation of granules. Locally available sand is being used by M/s Ciba Geigy Limited for formulation of granules by the coating techniques.

11. Containers for pesticides:

At present, Hashmey Can Company Limited, enjoys the sole monopoly of its manufacture. Locally manufactured containers are usually substandard and not leak-proof. This is mainly due to poor quality control. With a little bit fof effort, this problem can be overcome. Leak-proof containers are an important pre-requisite in pesticide industry in order to avoid toxic hazards/crops contamination etc.

Nowadays, large containers are not preferred. Small pesticide containers of 1 to 5 gallon capacity are generally preferred. For liquid formulations, aluminium and tin containers are not only desirable but also economical.

For solid formulations like dusts, water dispersible powder (WDP) and granules, packages of desired specifications are being produced locally but for certain granular and WDP formulations, special packing material with thin inner aluminium lining is required which is presently being imported. It results in its becoming very expensive due to import duties etc. No such arrangement for making inner aluminium lining presently exists in Pakistan.

Unless, the problem of preparing standard pesticide containers is solved, local formulation industry can not flourish.

Suggestions for improvement

In view of the foregoing, it is suggested that private industry should get proper encouragement from the Government and the existing pesticides formulation units in the country should

be encouraged to exploit their formulation capacities to their maximum. This can be done if alongwith the pesticides its other ingredients/auxilliaries are also exempted from government taxes etc. Furthermore, steps should be taken to produce pesticide containers of standard specifications in the country. Other genuine problems of pesticide industry should also be solved in order to provide them with an incentive to come forward not only for maximum utilization of the existing capacities but also for their gradual expansion in view of growing demand for pesticides in the country's agriculture.

IMPORT AND

Annex 10

PRODUCTION OF FORMULATED PESTICIDES IN PAKISTAN - YEAR COVERED: JANUARY to Dec.,31,1982

FORMULATED PRODUCTS			IMPORT	
Common Name	Concentration	Type	Quality in MT.or kilo liters	Total CIF value in thousands of USD[2]
Fungicides				
Dithane M	45%	WP	131.0170	590.324
Perenox	50%	WP	0.3960	1.3380
Cobox	50%	WP	27.1980	87.2310
Antracol	70%	WP	63.8300	235.1430
Cupravit	50%	WP	9. 250	32.1197
Brestan	60%	WP	0.0295	0.5490
Captan	50%	WP	17.5082	86.0860
Saprol	19%	EC	1.1580	14.6300
Vitavax			0.8800	7.0720
Topsin M	17		1.0500	14.2520
Liro-Manzeb	8	WP	9.⁄ 50	1.3590
Polyram Combi			0.5350	2.8630
Benlate	70	WP	1.0000	29.7270
Antimucin	4%	WP	6.1000	46.2400
Rab ide	30%	WP	0.2500	1.3000
TOTAL:-			270.1517	1150.2337

Formulated Products			Import	
Common Name	Concen-tration	Type	Quality in M.T.or Kiloliters	Total CIF value in thosuand of USD
INSECTICIDES				
Ambush	25%	EC	16.195	469.19
Perfekthion	40%	EC	197.236	1496.493
Endrin	19.5%	EC	228.454	849.978
Heptachlor	32.1%	EC	10.384	44.49
Anthio	25%	EC	26.4	157.70
Ekalux	25%	EC	16.503	155.95
Disulfoton	10%	G	181.56	266.66
Lorsban	40%	EC	53.808	605.48
Methyl Parathion	50%	EC	86.249	439.324
Malathion	57%	EC	33.185	166.299
Diazinon	60%	EC	9.685	80.45
Diazinon	10%	G	296.433	356.097
Diazinon	5%	G	90.00	66.66
Orthene	75%	SP/WP	33.435	469.987
Cidial (Elsan)	50%	L/E	19.608	150.005
Furadan	3	G	446.865	581.172
Dipte-rex	80%	SP	12.750	74.791
Gusathion M	20%	EC	52.585	392.685
Lebyacid	50%	EC	.090	0.814
Metasystox-R-25	25%	EC	15.758	118.163
			1827.183	6942.388

Formulated Products			Import	
Common Name	Concentration %	Type	Quality in M.T. OR Killoliters	Total CIF value in thousand of USD
INSECTICIDES Cont'd.				
Carbicron	100	SCW	0.266	4.831
Dimecron	50	SCW	7.896	67.592
Dimecron	100	SCW	52.372	395.889
Nuvacron/Azodrin	40	SCW	96.306	571.984
Nogos/Dedevap SL	100	EC	17.945	155.786
Supracide	40	EC	2.436	33.443
Sumithion	50	EC	61.268	473.225
Sumicidin	20	EC	92.5145	2800.509
Padan	4	G	136.141	87.298
Thiodan	35	E	124.647	983.665
Thiodan	5	G	92.66	43.171
Thiodan	25	ULV	32.775	202.218
Hostathion	40	EC	77.848	917.285
Decis	2.5	EC	19.886	654.439
Decis	0.5	ULV	22.725	152.053
BHC	5	D	2.235	1.460
BHC	10	D	184.706	161.721
BHC	12.5	WP	23.072	37.886
BHC	23	Tech.	231.82	47.551
DDT	25	EC	218.947	569.431
DDT	10	D	16.4	10.969
DDT	5	D	Nil	---
DDT	75	WP	1.175	3.406
Sevin	85	SP	58.737	426.641
"	10	G	2.025	2.257
"	10	D	16.77	14.738
Sevidol	4:4	G	311.13	345.242
"	3:8	G	26.629	44.456

Formulated Products			Import	
Common Name	Concen-tration	Type	Quality in M.T. OR Killoliters	Total CIF value in ~~MxExxOR~~ thousand of USD
Padan	10	G	52.259	58.995
Actel	50	EC	14.30	122.178
Zolone DT	41.25	EC	85.935	314.249
Te-mik	10	G	12.0959	73.406
Celathion	50	EC	50.808	566.78
Nexagan	80	EC	1.994	26.620
Nexion	25	EC	0.1585	1.060
Bidrin	85	SCW	1.990	42.012
Birlane	24	EC	0.075	0.407
Birlane	10	G	19.95	32.249
Dieldrin	20	EC	36.249	147.010
Phosalone			5.00	20.437
Ripcord	10	EC	29.88	1042.375
Vapona	100		0.60	7.025
Lorsban	50	ULV	3.97	66.384
Curacron	500	EC	10.73	56.138
Hostathion	25	ULV	46.025	328.408
Thimet	10	G	199.075	399.458
Dacamox	5	G	3.80	6.495
Cymbush	25	EC	2.616	77.587
Zolone	35	EC	16.715	111.796
Bactospeine			1.025	13.260
Baythroid	50	LS	0.630	19.571
Polytrin C	44	EC	61.984	1158.459
Permasect	25	EC	4.000	124.853
		GRAND TOTAL :	4420.2789	20968.746

Formulated Products			Import	
Common Name	Concentration	Type)	Quality in M.T. OR Kiloliters	Total CIF Value in thousand of USD
HERBICIDES				
Gesapex Combi	80%	WP	20.950	192.036
Dicuran MA	60%	WP	12.599	124.482
Primextra	500%	FW	7.374	67.926
Gramoxone	20%	EC	24.62	181.60
Tribunil	70%	WP	2.0179	19.747
Banvel	40.6%	EC	1.903	13.666
Saturn	10%	G	1.011	4.848
Stomp	330%	EC	0.475	4.4126
Buctril M			17.0	151.607
			129.8699	828.4106
MITICIDES				
Morocide	40%	E	1.992	14.841
Akar	50%	EC	2.449	21.478
Tedion	18		6.00	33.354
Polytrin'C	(See insecticides	)		
			10.441	69.673
FUMIGANTS				
Phostoxin		Tab.	13.545	205.131
Methyl bromide		Cyl	2.435	7.714
EDCT		Mix.	53.147	56.725
			69.127	269.570
RODENTICIDES				
Zinc Phosphide		P	1.1315	7.843

QUANTITY OF PESTICIDE FORMULATIONS USED IN PUBLIC HEALTH AND OTHER NON AGRICULTURAL SECTORS IN PAKISTAN - Year covered: January 1 to December 31,1982

Formulated Product			Quantity in terms of formulated WT M.T or Kiloliters	
Common Name	Concentration	Type	Used in Public Health[1]	Other Non-Agri. use [2]
FUNGICIDES----------			NIL ----------	
Insecticides				
Residual Insecticides				
Malathion	50%	WDP	Nil	Nil
Fenitrothion	40%	WDP	628 M/Tons	Nil
LARVICIDES				
Fenthion(Baytex)	2%	Gr.	400 M/Tons	Nil
Temephos (Abate)	2%	Gr.	100 M/Tons	Nil
Chlorpyrifos (Dursbban)	2%	Gr.	60 M/Tons	Nil
Primiphos Methyl (Actellic)	50%	EC	10350K.Litres	Nil
Synthetic Pyrethroid		ULV	5000 K. "	Nil
		TOTAL:	Solids 1188 M/Tons	Nil
			Liquids 15, 350 K. Litres.	Nil

1. USED IN PUBLIC HEALTH INCLUDES PESTICIDES USED IN THE CONTROL OF RODENT BORNE AND VECTOR BORNE DISEASES AS WELL AS THOS FOR HOUSE HOLD USE.

2. OTHER NON AGRICULTURAL USE INCLUDE PESTICIDES NOT USED FOR AGRICULTURAL OR PUBLIC HEALTH SUCH AS STRUCTURAL PESTICIDES, WOOD PRESERVATIVES, TERMITE CONTROL AND INDUSTRIAL USES.

ANNUAL CAPACITY OUTPUT OF LOCALLY FORMULATED PESTICIDES IN PAKISTAN - Year covered: January 1 TO December,31,1982

Formulation Type	Annual Capacity[2] in M.T. OR Kilolitres	QUANTITY OR OUTPUT [1] in M.T. Or K.Lits.				
		Insecticides	Herbi-cides	Fungi-cides	Rodenti-cides	Others
G. Granules	22300 M.T.	1493 M.T.	Nil	Nil	Nil	Nil
D. Dust		278.65				
WP. Wettable powder	9500 M.T.	M.T.	Nil	Nil	Nil	Nil
SC. Soduction concentrates.		Nil	Nil	Nil	Nil	Nil
EC. Emulsifiable concentrates.	15300 K.Lit.	975.88 K. Lit.	Nil	Nil	Nil	Nil
~~WDX~~						
ULV Ultra Low Volume						
For FW Suspension Concentrates						
OTHERS						
GRAND TOTAL	31800 M.T. 15300 K.L.	1771.65 M.T. 975.88 M.L.	Nil	Nil	Nil	Nil

1. MEASURED IN TERMS OF FORMULATED WEIGHT
2. ANNUAL CAPACITY OF MANUFACTURING PLANTS ON 300 DAYS, 2M 8 MRS/DAY BASIS

TOTAL PESTICIDES,1982

S.No.	CATEGORY	QUANTITY	VALUE	
			$ 000	Rs.000
1.	Fungicides	270.1517	1150.2337	15.477.3146
2.	Herbicides	129.8699	828.4106	11.146.9274
3.	Insecticides	4420.2789	20968 .7460	282.151.252
4.	Miticides	10.4410	69.6730	.937.5060
5.	Rodenticides	1.1315	7.8430	.105.5338
6.	Others	69.1270	269 .5700	3.627.280
		4,901.0000	23,294.4763	313445.8138

Annex 11

ORG 130/2/1.25-00 - JCP/31

15 April 1981

Mr N Mahmood
Deputy Secretary

Ministry of Agriculture
"B" Block

Islamabad

Findings of Research Work on the use of DDT

Dear Mr Mahmood

I refer to your letter of the 19th of February 1981 on the above mentioned subject. I have taken the matter up with the appropriate officers in our Headquarters including our specialist in Pesticides Residues. This letter incorporates his comments.

The short answer to the query contained in the final paragraph of your letter is that FAO itself does not carry out research neither has FAO undertaken missions in this field. However our pesticides research specialist has worked for many years on safety evaluations and is abreast of the current world wide scientific knowledge on DDT.

The data on the properties and effects of DDT compiled over 25 years is more than extensive - it is monumental. Reviews of reviews have often disguised the fact that much of the data is conflicting, partly due to some evidence characterized by poor experimental planning and techniques, dubious conclusions and in some cases even false data. This has led to a number of subjectives attitudes but fewer objectives ones and this has placed many member countries in a difficult position.

The joint FAO/WHO meeting in 1979 considered DDT but agreed not to change the conditional acceptable daily intake of 0.005 mg/kg set in 1969 pending further review. I attach to this letter a copy of the short statement in the 1979 report. More evidence is coming forward showing that DDT is not so persistent under hot, humid conditions and it is difficult to justify not using a safe, efficient and inexpensive pesticide such as DDT when the risk/benefit balance is so weighted on the benefit side.

The pesticides residues specialist has indicated that he would be happy to make a more detailed comment should this be necessary.

I look forward to hearing from you further on this matter. It would be interesting to know if you would like us to undertake any further activity or if the above comment is sufficient for the government in its self.

With kind regards,

Yours sincerely

John C. Phillips
Representative

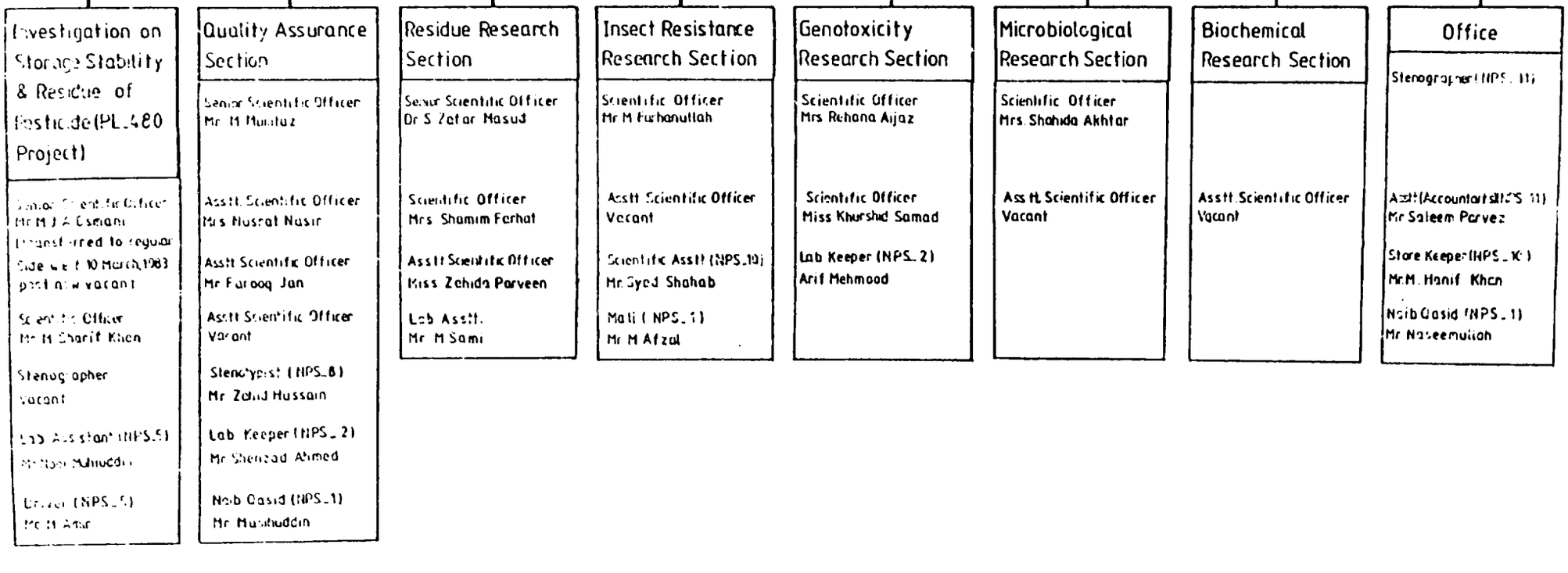
ORGANIZATIONAL SET UP

Annex 12

PRINCIPAL SCIENTIFIC OFFICER

(HEAD)

Mr. M.M.H.Baig



Annex 13

Documents Consulted during the Mission

1. The Pesticides Industry in the RCD countries, a Regional Study on Joint Purpose Ventures prepared for Ministry of Economy, Government of Iran, by Chemical Consultants (Pakistan) Limited, 1966.

2. Study on Underutilization of Capacities in the Fertilizer and Pesticide Industries by P.L. Branolt for UNIDO, 1971.

3. Plant Protection in Turkey, Iran, Afghanistan and Pakistan by C.S. KOEHLER et. al for USAID, 1972.

4. Ordinance No.11 of 1971, Ministry of Law, Pakistan.

5. Agricultural Pesticide Rules, Ministry of Food, Agriculture and Cooperatives, Pakistan, 13 August, 1973.

6. Analysis of Pesticides Use in Pakistan by W.E. Yates et.al. for USAID, August, 1974.

7. Lectures and Studies on Agriculture by Sultan Ali Chaudhry, 1976.

8. Insecticides/Pesticides Study, Pakistan by Sanderson and Porter Inc. New York for USAID, 1976.

9. Position Paper on Chemical Control Techniques as Part of a Plant Protection Policy for Pakistan, FAO, 1977.

10. Basic Supply and Marketing Data on Agropesticides in Pakistan, ESCAP/ARSAP, April 19 1.

11. Plant Protection by Sultan Ali Choudhry October, 1981.

12. A Review of Current Pesticide Regulations and Recommendations to Privide More Effective and Safer Use of Pesticides in Pakistan by F.M. Turk, UNDP (TOKTEN) Consultant, April, 1983.

13. Studies on the Storage Stability of Pesticides and their Residues on Crops in Pakistan by M.M.H. Baig, 1983.

14. Studies on Product Development and Quality Control of Pesticides, research proposal by M.M.H. Baig, 1983.

15. Status of Plant Protection and Pesticides Industry in Pakistan by M.M.H. Baig, 1983.

16. Strengthening of Pesticides Research Facilities in Pakistan - a development plan by M.M.H. Baig.

17. Annual Report of 1982-83, Pesticide Research Laboratory, PARC, Karachi.

Annex 14

Officials and Experts met and consulted during the mission

1. Dr. Amir Muhammed, Secretary, Agriculture Research Division, GOP and Chairman of PARC, Islamabad.
2. Mr. Manzoor Ahmad, Additional Secretary, Food and Agriculture Division, GOP, Islamabad.
3. Mr. Kunwar Idris, Additional Secretary, Production Division, GOP, Islamabad
4. Mr. Majeed Akhtar, Joint Secretary, Ministry of Industries, GOP, Islamabad.
5. Dr. M.H. Chaudhry, Chairman, Federal Chemical and Ceramics Corp Ltd. (FCCCL), Karachi.
6. Dr. A.S.K. Ghouri, Director General, Agriculture Department, Lahore.
7. Dr. M. Yousaf Chaudhri, Member (Crop Sciences), PARC, Islamabad.
8. Mr. Umar Khan Baloch, Director of Research (Crop Protection), PARC, Islamabad.
9. Mr. A.H. Razi, Joint Secretary, Food & Agric. Division, GOP, Islamabad.
10. Mr. Fariduddin Ahmad, Plant Protection Advisor/Director, Ministry of Food and Agriculture, Dept. of Plant Protection, Karachi.
11. Mr. M.M.H. Baig, Govt. Analyst, Principal Scientific Officer, Pesticides Research Laboratory, PARC, Karachi.
12. Dr. S. Zafar Masud, Senior Scientific Officer, Pesticides Research Laboratory PARC, Karachi.
13. Dr. Shabbir A. Qureshi, Member, Technology, PCSIR, Karachi.
14. Dr. M.A.A. Beg, Director PCSIR Laboratories, Karachi.
15. Prof. Atta-ur-Rahman, T.I. Co-Director, H.E.J. Research Institute of Chemistry, University of Karachi.
16. Mr. Naveed Ahmad, General Mananger, Production and Planning (FCCCL) Karachi.
17. Mr. Ahsan Qasim Siddiqui, Manager Production and Planning, (FCCCL) Karachi.
18. Dr. A.K. Qureshi, Managing Director, Ittehad Chemical and Ittehad Pesticides, Kala Shah Kaku.
19. Mr. Kazi Ahmad Jamil, General Manager (Works), Ittehad Chemicals and Ittehad Pesticides (IP) Kala Shah Kaku.
20. Mr. Mushtaq Ahmad, Senior Marketing Manager, IP, Kala Shah Kaku.
21. Mr. Fazal Qadir, Manager Marketing, IP, Kala Shah Kaku

22. Mr. R.M. Bokhari, Chairman, Pakistan Agricultural Pesticide Association, Chemical Manager, Pakistan Burmah Shell, Ltd, Karachi.

23. Mr. David J. Grieve, Manager, Agricultural Division, Hoechst, Karachi.

24. Mr. Mohammad Azim Piracha, Manager, R & D (Hoechst), Karachi.

25. Mr. Jost Frei, Divisional Manager, Ciba-Geigy (Pak.) Ltd. Agricultural Division, Karachi.

26. Nasser N.S. Jaffer, Director, Jaffer Brothers Ltd. Karachi.

27. Mr. Irshad Ahmad, Technical Adviser, Agro-Chemicals Section, Nichimen Corporation, Lahore.

28. Mr. Abdur Rafay, General Manager, Agro-Chemicals, Ltd. Karachi.

29. Mr. Jamal Haider, Manager, Agro-Chemicals Ltd., Karachi.

30. Mr. Aziz Damji, Managing Director, Aricides Ltd. Karachi.

31. Mr. A.Q. Hasain, Manager, A.G. Services and Supplies, Karachi.

32. Mr. Himalaya S. Rana, Resident Representative, UNDP, Islamabad.

33. Mr. John C. Phillips, FAO Representative, Islamabad.

34. Dr. Iqbal Muhammad Chaudhri, National WHO Representative and Programme Coordinator, Islamabad.

35. Dr. S.M. Mujtaba, Director, Directorate of Malaria Control, Minsitry of Health, Rawalpindi.

36. Mr. P.B.A. Santen, JPO UNDP/UNIDO, Islamabad.

37. Mr. M. Shafi Senior Manager, Nowshera DDT Factory, Nowshera.

38. Mr. Mohammad Inam Baig, Finance Manager, Nowshera DDT Factory, Nowshera.

39. Mr. Sultan Ali Chaudhry, Managing Director, Farm Chemical and General Services, Lahore.

40. Mr. Abid Beshir, Section Officer, Ministry of Industries, GOP, Islamabad.