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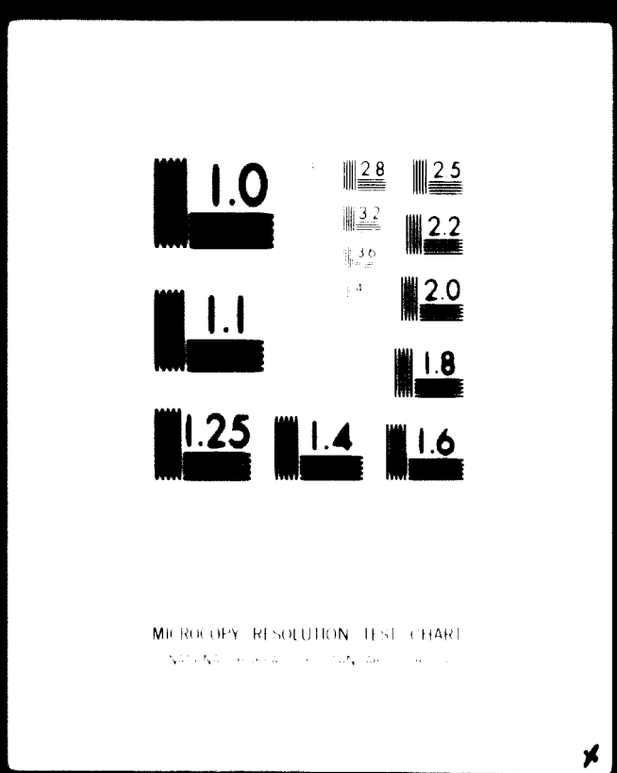
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Report on Exploratory Mission to Greece

(R) "Assistance in the Production and Formulation of Pesticides"

between 4 and 22 September 1971

by

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UNIDO, Vienna

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on mission to Greece between 4 and 22 September 1971 by L. Szabo, Industrial Development Officer Fertilizers, Pesticides and Petrochemicals Section, IPD, UNIDO, Vienna Austria.

I. Introduction:

1. The Government of Greece requested an exploratory mission by UNIDO to assess the feasibility of national pesticide production and recommend further technical assistance by UNIDO in areas where practical. The official request was transmitted to UNIDO by cable DP 314 of 21 June sent by the Resident Representative's office in Athens. (Annex I) A copy of the official request, dated 10 June 1971 has been also subsequently received (Annex II).

2. The main objectives of the mission as defined in the Project Data Sheet (Annex III) was to assess the feasibility of domestic pesticide production and formulation and to make recommendations as to follow-up actions and further UNIDO assistance by establishing, in consultation with the appropriate Government officials and based on available data, the following :

i.) the availability of raw materials and know-how for locally producing those pesticides which are of great importance to the agriculture and economy of Greece;

ii.) the possibility of such production in view of existing patent coverage of important pesticides;

iii.) the requirements of the domestic formulation of important technical materials;

iv.) recommendations as to the continuing technical assistance by UNIDO to the Government of Greece and preparation of draft Project Data Sheets outlining the objectives of a follow-up assistance programme.

II. General Information

3. Background information: agriculture is an important sector of the Greek national economy. Its total contribution to the G.N.P. is about 30%, equal to that of the industrial sector. Main crops include cereals (of which wheat is the most important) and olives as chief food crops; tobacco, currants and raisins are the main cash crops. Rice and cotton have increasing importance. Agricultural products are of high importance in earning foreign exchange. Tobacco accounts for over one-quarter of the total export. Greek exports traditionally fail to cover import requirements. All pesticides, inorganic and organic, are presently imported either as formulated final products or as technical active materials.

4. With the assistance and co-operation of the local Office of UNDP (Mr. Croisier and Mr. Jones) and the Ministry of Co-ordination, Technical Assistance Division (Mr. Triantafyllopoulos) a comprehensive interview-programme has been set up to secure the necessary information for the assessment of the present situation and potential development of the pesticide industry in Greece. Sincere gratitude is expressed to the above officials and all others with whom discussions were held for their kind co-operation. A list of the persons met and industries and institutions contacted or visited is appended as Annex IV. A listing of various expert and official reports made available to the Mission is also appended as Annex V.

5. Government officials as well as technical and administrative leaders of different institutions and companies generally expressed considerable interest in receiving future UNIDO technical assistance.

6. General status of the production and use of pesticides in Greece. No active technical material is produced in the country, consequently the demand is being covered by import. There is little regulatory control applied to these imports. Recently a Legislative Decree (411/1970) has been issued in conjunction with Law 2147/52 which has established the fundamental provisions for the control of pesticides and their registration procedures. According to the above decree a network of control laboratories is to be set up whose operations will be co-ordinated with that of the Central State Laboratory in charge of Quality Control of Pharmaceuticals and Phytopharmaceuticals, which is located in Athens under the joint supervision of the Ministry of Economy and the Ministry of Social Affairs. The Central State Laboratory has no regulatory responsibilities at the moment. About 2/3 of the pesticides

is imported by private firms, mostly in formulated form who also act as packaging, distribution and sales agencies. The remaining 1/3 (all $CuSO_4$ and S, and some organic materials) is imported by the Agricultural Bank. All products imported by the Bank are imported as end-products except sulphur which is locally ground to the required particle size and distributed to agricultural co-operatives for packaging. The Bank also tries to set reasonable prices by forcing private enterprises to compete. The Bank also provides crop-term loans to farmers usually at favourable interest rates, for purchasing pesticides. Apart from competition imposed through the marketing efforts of the Agricultural Bank no other government intervention is evident in the commerce of pesticides. However, subsidizing such industries which could save large amounts of foreign exchange seems to have an appeal in government agencies. As for production of pesticides, as a matter of policy the Government would generally prefer to leave it to private industries without government participation. Participation of foreign companies, ready to invest and in posession of know-how, would be welcome by the Government. Accordingly the Government would not encourage local production of such pesticides which are currently imported as proprietary products by foreign companies. Potential production of such products is envisaged in the framework of a co-operative effort.

7. Contrary to the background information incorporated in the Project Data Sheet the local formulation of pesticides seems to be already taken care of in Greece. There is at least one modern formulation plant in operation in Thessaloniki capable of producing both liquid and solid formulations in a great variety and several other plants are being planned or are under construction in other parts of the country. Thus the immediate concern of the Government concerning pesticide production is rather associated with the local production of the technical active materials of the greatest importance and demand, than with formulation problems.

III. Market Information

8. The Ministry of Agriculture which was recently incorporated into the Ministry of National Economy, has prepared an elaborate table showing the annual domestic consumption of major pesticides for the last ten years. This enumeration is attached to this report as Annex VI.

9. According to the figures given in Annex VI in Greece there is still a strong demand for traditional inorganic pesticides, such as copper salts,

sulphur, etc. The other general observation one has to make is that dusts are used to a much greater extent than the emulsifiable or wettable products. This directly ties to the scarcity of water sources in many parts of the country. The farmers cannot afford the long distance transport of large volumes of water required in spraying techniques. Therefore they generally prefer the use of dusts. The acceptance of the granulated products is by no means wide spread, but the stepwise introduction of such solid preperations has lately started.

10. The major pesticides used in Greece are listed below:

Inorganic	Organic		
	Chlorinated	Phosphorus	Others
S	Hexachlorobenzene	Parathion	Sevin
$CuSO_4$	2 4 D	Me-Parathion	Mercurials
Cu OCl	MCPA	Malathion	Mineral Oils
	DDT	Diazinon	Vapam
	BHC	Dimecron	Zineb
	Aldrin	Metasystox	Maneb
	Lindane		
	Heptachlor	Dimethoate	
		Dipterex	
		Fenthion	
		Birlane	

Endosulfan, Binapacryl Dicofol, Folosan, Dalapon, Azinphos, TMTD, Brestan, Duter, Benlate Vamidothion, Azodrin, etc. are also imported and sold in lesser amounts. Copper salts, sulphur, organic phosphates, carbamates (including ditiocarbamates) and chlorophenoxyacetic acids represent the bulk volumes of this list.

11. Yearly imports of pesticides amount to 500 million Drachmas, approximately equivalent to 17 million US dollars. The Agricultural Bank is importing and distributing about one fifth of the total, in a value of 100 million Drachmas. Copper salts and S are entirely imported by the Bank, while other pesticides are sold by the Bank in relatively small quantities with the purpose of forcing the private importers and distributors to compete with prices set by the Bank. Private industry handles a larger portion of the

total volume amounting to an annual value of 200 million Drachmas. Household insecticides mainly aerosols are also marketed by private industry to the tune of 100 million Drachmas p.a. The Ministry of Agriculture is directly involved in the purchase and use of such insecticides which are applied against the olive-fly because of the great importance of olive-production for the national economy. This action costs about thirty million Drachmas to the Government. (US $ 1=30 Drachmas)

IV. Formulation of Pesticides

12. As briefly referred to in paragraph 7 the local formulation of pesticides has already gotten a promising start. Sulphur Hellas Co., located near Corinth, operates a modern dust formulation plant with a capacity of more than 40 000 tons p.a. exclusively applied for the formulation of sulphur containing dusts. The plant is equipped with a variety of grinding facilities (ball-mills, hammer-mills and air-mill) and cyclon separation system. Nearly 40,000 tons of sulphur-dust (composition 96% sulphur and 4% kaolin) is yearly processed here. The domestic demand amounts to about 20,000 tons p.a. The rest of the production goes to exports. Yugoslavia, USSR and Middle-East countries were named as recipients of these exports. No other solid formulations are performed by the company and it has no facilities for liquid formulation. The sulphur is supplied by foreign firms Lacque de France being the most important supplier. Good quality kaolin is domestically available.

13. At this moment DIANA Co. in Thessaloniki is the only company which operates a formulation plant well equipped for both solid and liquid formulations in Greece. The plant was built a couple of years ago with technical assistance obtained from Makhteshim Chemical Works Ltd Israel and Montecatini Italy. These two companies are the main suppliers of the technical active materials and also of the formulation technologies know-how. Makhteshim sells different insecticides and Captan Montecatini dithiocarbamate fungicides and Rogor (Dimethoate) to Diana. However Diana is currently buying technical materials from many other sources in lesser quantities. Péchiney supplies hexachlorobenzene used as a seed-dressing agent (12% active material). Procida sells organic-mercury compounds for the same application, while Methyl-Demeton is purchased from East-Germany and all these products are formulated by Diana. Herbicides are not yet included in the product line of the Company because the formulation of herbicides cannot be done in the same facilities or even location. The company is in the process of renting suitable grounds in

another industrial site where they intend to set up temporary operations for the formulation of herbicides. They are also concerned with environmental problems and would like the Government to review and approve of their plans. However, it seems that the Government has no standards and procedures set yet for doing so. This is why a temporary solution is sought in order to avoid involving large investments until unequivocal Government approval can be obtained.

14. The present facilities used for the formulation of insecticides fungicides and seed dressing agents were set up with an investment of 4.2 million Drachmas (140 000) of which two millions went for equipment the rest for the building. The grounds extend to 12.000 m^2 the building contains 2000 m^2. The equipment is up to date and includes all necessary elements for solid and liquid formulations automatic and semiautomatic transportation and packaging, a fairly good exhaust system and storage facilities. Some improvement can be made in housekeeping (decontamination of the working area) and handling (weighing and transferring) of highly toxic concentrates (technical active materials). The formulation equipment has been purchased abroad. The liquid formulation machinery was supplied by J. DeVree Co., mixing machines for solids by Pondalaers Co. and the packing facilities by Ateliers Jonkheers all Benelux firms. Capacities, calculated on eight hrs single shift/day basis are as follows:

Liquid formulations	14 000 to/yr
Solids (dust)	2,000 to/yr
Packaging (liquids	4.8 million bottles/yr
(dusts	1.00 million bags/yr

15. The organization and staffing of the company seems adequate for carrying on the present tasks of production and distribution. The technical direction is exercised by a chemist with the assistance of two chemical technicians, one mechanical engineer (part-time) and a mechanic-technician (permanent). There is little done in terms of quality control and technical development, at present. The laboratory of quality control is not yet fully equipped and operational. The company is aware of the necessity of establishing this operation, however. Ten agriculturists are employed in the technical services department who are concerned with advising and assisting customers and testing or demonstrating the usefulness of the products of the company. The network of the sales outfit is well developed including most of the agricultural co-operatives and 600 individual shops in addition. Current

sales of pesticides are in the magnitude of fifty millions Drachmas and projections call for eighty million Drachmas for next year.

16. One particular area where the company may find itself in a rather precarious situation is its development programme. As indicated the company relies on assistance obtained from firms from abroad, which includes testing the locally available carriers and recommendations on contemplated new compositions. Requests for some special tests (e.g. accelerated aging tests with potentially cheaper new mineral carriers suitability of local carriers for granular formulation etc.) do not necessarily get high priority in the work programme of the foreign firms, resulting in long waiting periods. In some instances a conflict of interest can also develop. For instance Diana is using a granular carrier supplied by Israel for its formulations. The same outfit is supposed to test and rate potentially available local carriers for Diana which creates a clear case of conflict of interest. The company would like to eliminate this inconvenience by establishing its own laboratory procedures to deal with problems of this kind. Lacking experience they would probably need assistance from an independent technical organization, like UNIDO.

V. Formulation Plants Planned or under Construction

17. Besides Diana's existing and planned (herbicide formulation) facilities there are a number of distributors who are in the process of establishing local formulation plants in co-operation with the foreign suppliers who will also furnish the know-how and equipment. These prospective formulators are as follows (for the full list of presently active and prospective formulators see Annex VII):

Hoechst Hellas with a total capacity of about 1000 to/yr.

Biofarm representing eight foreign companies (most of them from the USA) is building a formulation plant with a capacity of 2,500 to/yr.

Lapafarm is shooting for a capacity of 2,000 to/yr.

Hellafarm contemplates the construction of a 1,000 to/yr formulation plant.

Upjohn - a subsidiary of Farbenfabriken Bayer - plans to build a formulation capacity of about 2,000 to/yr.

Presently the total pesticide imports for domestic use amounts to from 31 to 32 thousand tons p.a. Of this 20,000 tons is S another 3,000 tons Cu SO_4, all formulated and distributed by Sulphur Hellas Co. (para 13). Summer oils

for ulated by oil companies (Shell Co.), make up another 1,000 tons per annum.

Thus there are about 8,000 tons of pesticide products left to be formulated by the rest of the companies for domestic demand. Obviously the currently avaible formulation capacities plus the ones in the offing will be sufficient not only for satisfying the domestic market but shall permit the re-exportation of formulated end-products in substantial quantities.

VI. Production of Technical Active Materials

18. The most important pesticides which also account for the largest part of the foreign exchange in the equivalent of US 17 million allocated for annual pesticide imports are as follows:

1. Copper salts
2. Sulphur
3. Chlorinated Organic Insecticides
4. Organophosphorus Insecticides
5. Chlorophenoxyacetic acids

The chlorinated organic insecticides are rapidly loosing ground because of their long residual presence in the environment and the potential pollution deriving therefre . Therefore they will not be considered here. The other groups will be treated one by one.

VII. Copper Salts

19. The principal forms of application of copper as a fungicide are copper sulphate and copper oxychloride in Greece. Both products are traditionally made of metallic copper or copper-oxide. None of these raw materials are produced in Greece at this time. Sulphuric acid and sodium chloride also required in the production of copper sulphate and copperoxychloride are available.

20. The possibility of establishing local production of electrolytic copper the common intermediate in the production of either copper salt referred to above, has been studiedby the Ministry of Economy, Division of Evaluation for Industrial Development Projects. The study has established that the domestic demand for copper falls far short of the minimum capacity of 25,000 tons of lectrolytic copper required for profitably operating such a plant, as shown by the following import figures between 1964 and 1968.

Imports of elemental copper

Year	Tons
1964	7,755
1965	7,101
1966	8,147
1967	9,104
1968	9,490

Agricultural applications represent a relatively small demand for copper, as indicated by statistical figures in the following table:

Copper salts used in agriculture (in tons) during the period of 1964 - 1970

Year	$CuSO_4$	Copper oxychloride	Equivalent in copper metal*
1964	6.767	310	1.845
1965	5.251	332	1.479
1966	4.791	257	1.328
1967	4.207	450	1.277
1968	3.605	232	1.038
1969	3.869	240	1.089
1970	4.000	255	1.128

* Based on 25% elemental copper content in copper sulphate and 50% in copperoxychloride.

The quantities of elemental copper required for agricultural applications were relatively small (less than 10% of a 25 000tons/yr production contemplated for an electrolytic copper plant) and showed decreasing tendency leveling off at about 5% of the theorethical 25,000to/yr figure. Thus the establishment of an electrolytic copper plant cannot be justified or strongly supported by agricultural demands and vice-versa copper for agricultural applications would probably have to come from other sources at least for a few more years.

21. Copper oxychloride is made by blowing air into a vigorously agitated suspension of copper scraps in sodium chloride solution. It seems feasible to believe that most of the copper scrap required in an amount of 150 tons for a 300 tons copper oxychloride annual production, can be collected in Greece. Based on this assumption Bodosikis (holding company) is planning to establish a copper oxychloride production plant to be operated by the Hellenic Chemical Products and Fertilizer Company.

22. While the demand of copperoxychloride for agricultural applications shows a firming up trend, that of copper sulphate has substantially declined. This decline was due to the substitution of organic mercury compounds for copper sulphate as a seed dressing agent. Besides, some ground was also lost to copper oxychloride due to the more convenient handling and some special applications of the latter product. However it is believed that the copper sulphate demand for agricultural applications will stay even and firm for at least five perhaps many more years.

23. The local production of copper sulphate faces difficulties not only because an adequate raw material base has not been yet identified but also because according to legislation presently in force it would not enjoy any of the privileges and supports granted to many other industrial projects and products by the Government. Law No. 4467/65 on the protection of domestic industries clause 5 paragraph 2 jointly endorsed by the Ministry of Industry and Ministry of Agriculture suspended the enforcement of the provisions regarding the protection of domestic industries for the commodities used in the agricultural sectors. Based on this arrangement, a joint decree has been issued by the Ministries of Industry and Trade, under protocol No. 25 607/10025/ 2.II.65, by which the enforcement of law 4467/65 has been indefinitely suspended as regards copper sulphate and sulphur imports which under the provisions of law AN 2022/39 has become the monopoly of the Agricultural Bank.

24. In view of the absence of elemental copper, a situation not likely to change in the near future, the considerations given to the local production of copper sulphate should be based on some other raw materials.

25. There are several copper-ore deposits in Greece some in the Peleponnesees (Vermioni Larymna) and many more in the northern parts of the country (Chalkidiki Skouries, Olympos etc.). Most of the deposits are mixed sulfides, although in the Chalkidiki and Olympos areas there are also copperoxide ore deposits. Copper oxide could be a good raw material for making copper sulphate, but the ores are believed to be of rather low copper contents (0.7 - 1.5%) and inferior quality. In many of these areas prospecting rights have been given to foreign companies (e.g. Placer Ltd. Péchiney and other American-Canadian Concerns) but some are in the possession of Greek individuals and Companies (Mrs. Benetou, Mr. Anarios Macedonian Copper Mines, Hellenic Chemical Products and Fertilisers). Since the ores would be adaptable to copper sulphate production only in an enriched concentrated form the

possibili y of erecting ore dressing units has been discussed. However, investment which may be requir d i the m. nitude of 15 million for erecting a concentrate processing (dressing) unit with a yearly capacity of 30,000tons of a 30' concentrate is not likely to come for the sake of copper containing agricultural chemicals estimated at an average annual production value of 1.1 million.

20. Another alternative could be to examine the possibility of making copper sulphate by a direct sulphuric acid treatment of concentrated roasted copper pyrite ores. There is a copper-pyrite deposit in the Peloponnesus (Hermioni) with a copper contents of 3 . This is presently used in the fertilizer production processes of the Hellenic Chemical Products and Fertilisers Co. After roasting the copper contents is enriched to 4 . The company exports this roasted concentrate (about 50,000 to s .a.) to ast-Germany while the country is importing the copper sulphate fro abroad, a substantial amount of hich comes fro ast-Germany. 50,000 tons of roasted copper-pyrite concentrate of 4 is equivalent to 2,000 tons of elemental copper more than the requirement for agricultural uses (re. para 21.). The selling price of the roasted copper-pyrite ores is fixed according to the actual copper contents and current world market price of copper. (he price of the copper has been fluctuating betwe US 250 and 700/to for the recent months). Imported copper sulphate cost US 350 - 400/tons. Since one ton of copper yields four tons of copper sulphate an attainable minimum five fold increase in value and sulphuric acid the other raw material is do estically available it seems worthwhile to carry out a detailed study on the technical and economical feasibility of producing copper sulphate from copper-pyrite concentrates in Greece. Both the inistry of Agriculture and the Hellenic Chemical Products and Fertiliser Company expressed interest in such a study. The Government also seems prepared to provid incentives and legislative protection for private industries if local production of copper sulphate can be achieved at a cost of 400 - 420/tons inclusive profits at the manufacturing level.

III. Sulphur

27. ulphur is the largest single item of pesticides used in Greece with an annual consumption of well over 20 000 tons. It is used as a ( ) dust component of cottondust which also contains 5-10' carbaryl (N-methyl-alpha-naphthylcarbamate) with inert ingredients making up for the rest. The total sulphur consumption in Greece amounts to 125,000 tons p.a. Of this amount 75,000 tons go for the production of sulphuric acid and fertilisers,

respectively, and another 25,000 tons are formulated in dust form and re-exported as a fungicide.

20. The sulphur directly used for agricultural dust preparations is imported from France at a cost of US 27/ton, somewhat higher than the current US 22.50 - 25.00 world market price, because of stringent purity requirements seldom met by shipments coming from other sources. It is particularly important to keep such impurities as Fe, Se, and As at a minimum in the vineyard application to avoid crop damage. The French sulphur also exhibits outstanding physical characteristics of great importance for pestcontrol applications in viticultures, namely: reduced hardness, increased adhesiveness and low electrostatic charge. The latter characteristic is of particular importance in reducing the danger of self-ignition during the grinding processes. The Agricultural Bank and Sulphur Hellas has Government approval for importing French sulphur until 1974 and it is hoped that by then the gradual substitution of domestic sulphur for the French import may be possible. According to data provided by the Agricultural Bank demand for pesticidal grade sulphur shows a continuously increasing trend:

Sales		Forecast	
Year	Tons	Year	Tons
1965	15,700	1971	21,000
1966	17,311	1972	22,000
1967	16,051	1973	23,000
1968	20,734	1974	24,000
1969	19,140	1975	25,000
1970	20,000		

The US dollar values of sulphur imports almost doubled during recent years as shown by data supplied by the Greek National Statistical Office in its report on the Greek External Trade:

Imports of sulphur (taxes paid)

(including supplies of the fertilizer industry)

Year	Tons	Value US
1965	79,504	3,005,000
1966	84,160	4,925,000
1967	90,514	6,052,000
1968	100,465	6,038,000

The dollar value of sulphur imports in 1968 was lower than in 1967 in spite of the larger volume. This can be attributed to a considerable decrease in the world market price which has continued to follow the same trend since.

29. There is one known sulphur deposit in Greece located in the island of Milos and owned by the Scalistiri Concern. The deposit is sizable, estimated at 7 to 8 millions of tons, but of poor quality, being a mixture of 13-15% sulphur and clay. Prospecting and attempts to separate the sulphur from the mixture have been conducted by the company which technically seems to be knowledgeable and employs more than 100 professionals among them about thirty mining engineers.

The process evaluated by the company consisted of autoclaving the crude sulphur-soil mixture, followed by a floatation-separation at reduced temperatures. The company estimates the production cost of sulphur by this method to be about US 25/ton, exclusive depreciation cost and profits. The potential selling price has been put between US 35 and US 40/ton. On this ground it is thought that the exploitation of the Milos sulphur is not economical and feasible at the current low world market price.

30. No other domestic source of elemental sulphur is known in Greece now. It has been noted that a huge and chemically very pure gypsum deposit has been recently found in the island of Crete next to the sea-shore, readily accessible to cheap transportation. However, under present market conditions, it would be extremely difficult to support suggestions that sulphur be made of gypsum, since such a product would be at a tremendous disadvantage concerning cost of production.

I. Organophosphorus Insecticides

31. The agriculture is currently using an amount in excess of 500 tons of phosphorus insecticides in Greece and the forecast calls for an average 10% yearly increase in demand for the next five years. Some of the phosphorus insecticides used against the Dacus of olives (Dimethoate, Lebaycid, Phosphamidon) cost US 3 to 4/kg. to the Government. The combined annual demand of these types of products amounts to about 300 tons. Parathion and Methyl-Parathion are the second largest volume in the family of the phosphorus pesticides with an approximate yearly consumption of 200-250 tons at an average cost of US 1,10/kg. A dozen of other phosphorus insecticides (Malathion, Gusathion, Demeton, Azinphos, Methyl-Azinphos, Fenthion, Dirlane, etc.) are imported in relatively small quantities but combined still represent the largest portion of a nearly 1,000 tons p.a. market of phosphorus pesticides.

32. A total yearly requirement of 1,000 tons of phosphorus insecticides at first view seems to be high enough for justifying national production, particularly if one considers that an average annual increase of 8-10% in the demand is expected for the next five to ten years. However, the difficulty seems to be two-fold:

(a) with a few exceptions (alcohol, inorganic acids, solvents, chlorine and caustic soda) the raw materials and intermediates required in the synthesis of phophorus insecticides are not available from local sources. (b) The total requirement of 1,000 tons/yr is a composite figure of only a couple of larger single volumes (Parathions, Dimethoate) the rest being the sum of a large number of fragmentary product volumes.

33. In order to establish more favourable conditions for the local production of phosphorus insecticides it should be examined whether the substitution of the large-volume products for those having a very limited application in current agricultural practices is possible. Another case in point are Dimethoate and Lebaycid, both used in the protection of olives against the olive-flies with equal efficiency. The cost of both chemicals is about the same US $/kg, thus it seems possible to substitute one for the other. Patents covering Dimethoate have expired, while Lebaycid is going to stay under effective patent protection for almost another decade, thus Dimethoate would seem to deserve special attention when the feasibility of local production is considered. A third aspect of considerations given to a potential local production of phosphorus insecticides should be the investigation and evaluation of export possibilities to Middle-East and neighbouring countries, some of which are not expected to start production in the field of organic pesticides for many years to come.

c. Chlorophenoxyacetic acids:

34. These herbicides are widely used in the chemical weeding of cereals, primarily in that of the wheat, a crop cultivated on more than one million hectares in Greece. Consumption approached the 500 tons mark in 1968 and is believed to continue to grow as farmers learn about and realize the economic advantages attainable by the use of these herbicides. Further expansion of the market may become possible by incorporating chlorophenoxyacetic acids in herbicide combinations, such formulation are gaining in acceptance and popularity all over the world.

35. In view of this the economic production of a chlorophenoxyacetic-acid type of herbicide may be feasible in Greece. Some of the important raw materials (chlorine, NaOH) are locally available. The production technology is relatively simple and the capital investment requirement is one of the lowest in the area of organic pesticide production. No restrictive patents are in effect as to the production and use of these herbicides, except for a few concerning special formulations and combinations. The factors against establishing local production are as follows: lack of domestic source of phenol (or ortho-cresol) and acetic acid and relatively low world market price (ca US$600/ t). In spite of these latter points, it is believed that a feasibility study concerning the local production of chlorophenoxy-acetic acids is justified.

36. Under present circumstances the production of other organic pesticides in Greece does not seem to be attractive. Dithiocarbamates could have been considered as relatively large volumes but the only source of domestic CS_2, required in the manufacture of dithiocarbamates, has been cut off, when the Wine and Spirits Company a subsidiary of Hellenic Chemical Products and Fertilizer Company stopped its production and divested itself of all facilities. The CS_2 demand in the rayon manufacturing (viscose) is satisfied by imports from Western-Germany.

I. Conclusions and recommendations

37. The demand for agricultural and household pesticides has grown at a rapid rate in Greece thus justifying the establishment of local pesticide formulation plants. Most of the formulators and distributors, representing one or more foreign companies, technically depend on the know-how directly involved in the formulation of a given product made available by the foreign supplier of the active materials. Companies interested in establishing their own testing and development facilities and processes in order to undertake product development work, including the application of new local carriers their physical and chemical characterization and suitability for selected applications, will need more technical assistance, preferably from an independent organization, in the field of methods and instrumentation of formulation research and development. A draft job description, outlining the tasks and responsibilities of a pesticide formulation expert should the Government request expert assistance from UNIDO in this field is appended as Annex VIII.

38. The possibility of a production of active materials in Greece is limited by the scarcity of raw materials and fragmentation of the pesticide

markets. Copper salts, sulphur, organic phosphorus insecticides and chlorinated phenoxyacetic acid herbicides deserve special consideration as target items of the pesticide market.

39. The production of copper oxychloride, based on the utilization of copper scraps seems to be feasible. The demand shows an increasing tendency and the other raw materials are available. It is understood that the Hellenic Chemical Products and Fertilizer Company is contemplating the production of this product with the adaptation of foreign production technology. Should need arise, UNIDO will provide assistance in securing and applying the required production technology.

40. No conventional copper containing raw material seems to be available for the production of copper sulphate. It is possible that a roast copper-pyrite concentrate with a 4% of elemental copper contents, obtained as a by-product in the fertilizer production processes of the Hellenic Chemical Products and Fertilizer Company, may be used for making copper sulphate if proper technology can be designed to assure economic feasibility. A draft job description is attached as Annex IX, describing the qualifications and duties of an expert in the production of copper sulphate in case the Government shall decide to request expert assistance from UNIDO.

41. The local production of phosphorus insecticides is facing several difficulties such as lack of raw materials, fragmentation of the market and lacking know-how. However, the demand for some selected products, which already enjoy great popularity, may further increase if they can be substituted for other low-volume insecticides. The export potential is also a factor to reckon with. It is suggested that UNIDO conduct a study on behalf of the Greek Government on the feasibility of local production of phosphorus insecticides. The study should also investigate the feasibility of erecting a multi-product (purpose) plant for alternately manufacturing several phosphorus insecticides which are in substantial demand.

42. From a technical viewpoint the production of chlorinated phenoxyacetic acid herbicides seems to pose little problem: the applied technology is simple and available without the restrictions of a potential patent infringement and some of the raw materials (chlorine, caustic soda) are produced in Greece. Feasibility is questionable only because of the relatively small demand and low world market prices. A full study on the feasibility of production could be jointly carried out by the same mission which has been above recommended for the phosphorus insecticides. A draft job description covering the responsibilities of the expert(s) is appended as Annex X.

Annex 1

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coll dp314

Annex II

Kingdom of Greece

MINISTRY OF COORDINATION
GENERAL DIRECTORATE III
DIRECTORATE Techn.Assist.Division
Offices: 5 IPPOKRATOUS STR.
TEL. 230 - 531

Athens 18 June 1971

To: Mr. Marcel Croisier
Resident Representative
U.N. Development Programme
36 Amalias - ATHENS

Reg. No 29441/T3218

Ref. No

Subject: Pesticide Formulation and Production

Dear Mr. Croisier

In reply to your letters of 5 April and 19 May 1971 I have pleasure in confirming our agreement to the proposed exploratory UNIDO mission for a period of two or three weeks to assist the Government in examining the feasibility of local production of pesticides or formulation.

I would also like to point out that the Ministry of Agriculture will provide the above mission with the required data, and the authorities concerned will be at their disposal to discuss the various problems of the project.

Thanking you for your cooperation in this matter,

Yours sincerely,

G. TRIANTAFYLLOPOULOS
Director
Technical Assistance Division

Annex III

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNITED NATIONS DEVELOPMENT PROGRAMME

SPECIAL INDUSTRIAL SERVICES

Project Data Sheet

1. Reference Data:

- Country: GREECE
- Project Title: Assistance in the production and formulation of pesticides
- Project Number: - UNDP Ref: (Exploratory Mission)
  - UNIDO Ref: SIS 71/1373 (GR-4)
- Origin and Date of the Request: Letter from Resident Representative dated August 1970
- Purpose of the Project: To assist the Government of Greece in assessing the feasibility of domestic pesticide formulation and production.

2. Background Information:

Only about one fourth of the total area is arable and cultivated in Greece (36.500 km^2), but agricultural production is still of about equal relative importance to the industrial production in terms of GDP. Besides cereals the important crops are fruits and vegetables. Exports of fruits and vegetables play an important role in the trade with other countries as foreign currency earners, thus the protection of these crops against pests and diseases is of great concern. Almost all pesticides used in Greece are imported thus draining the foreign currency reserves and rendering the country dependent on foreign supplies. The establishment of a local pesticide industry and in particular, a local formulation industry, seems to be desirable. The following are the major types of pesticides currently used in Greece: copper salts, sulphur, dithiocarbamate fungicides, phosphorus insecticides, DDT and phenoxy herbicides.

3. Description of the Project:

UNIDO will assist the Government of Greece in assessing the feasibility of domestic pesticide production and formulation by sending a short-term (2 - 3 weeks) expert mission to study the question and make recommendations as to follow-up actions and further UNIDO assistance as required. The mission will establish, in consultation with the appropriate Government officials and based on available data, the following:

Annex III (continued)

(1) The availability of raw materials and know-how for locally producing pesticides of great importance for the economy of Greece;

(2) Possibility of such production with respect to local patent laws and patent rights;

(3) Feasibility and requirements of the domestic formulation of imported technical active material;

(4) Ways and means for continuing technical assistance by UNIDO to the Government of Greece in establishing a pesticide formulation plant;

(5) Preparation of a draft Project Data Sheet outlining the objectives and terms of reference of a follow-up assistance programme.

4. Project Budget:

Components:	Duration:	Cost:
Pesticide Expert (Staff Member)	2 - 3 weeks	US 1,500
Agency Overhead Costs: (11 %)		165

5. Request Approved:

(Signed) E. Ward
for UNIDO

Date: 19 - 7 - 71

Annex IV

Officials of the Government and Private Industries met and interviewed during the Mission

ATHENS

Mr. G. Triantafyllopoulos,	Director, Technical Assistance Division, Ministry of Co-ordination
Mr. Psaros,	Director of Phytophatology Division, Ministry of Agriculture (National Economy)
Mr. L. Kastandreos,	Officer in Charge of Pesticides, Phytopathology Division, Ministry of Agriculture (National Economy)
Mr. N. Vassios	Director Investment Evaluation, Ministry of National Economy
Mr. E. Vergopoulos,	Chemist Investment Evaluation, Ministry of National Economy
Mr. G. Cambitsis,	Director-General, Ministry of Industry (National Economy)
Mr. Art. Anastassakis,	Director Financial, Mining, Industrial and Shipping Corporation
Mr. N.D. Scalistiri,	President of LOKRIS Bauxite Mines and Financial, Mining, Industrial and Shipping Corporation
Mr. T.C. Eliasco,	Secretary-General, Macedonia Copper Mines, S.A.
Mr. Vainoglou,	Hellenic Industrial Development Bank, Industrial Pollution Control Unit (ITVA)
Mr. K. Zoulias,	Chemist, Hellenic Industrial Development Bank(ITVA)
Mr. A.G. Georgiou,	Technical Director Hellenic Chemical Products and Fertiliser Company
Mr. D.S. Vlastos,	Head of Project Development, General Mineral Exploration and Mining Development Corporation (GMEDC)

Annex IV (continued)

Mr. D. Corianitis	Mining Engineer Head of Mining Operations, General Mineral Exploration and Mining Development Corporation (GMEDC)
Mr. L. Xanthakos	Director of Wines and Spirits Co. Subsidiary of Hellenic Chemical Products and Fertiliser Company
Mr. S. Laskaris	General Director, [illegible] Mayon Co.
Mr. A.P. Petrides	Director Department of Mines Ministry of National Economy
Mr. A. Nestoridis, Mr. G. Mastrantonis,	both Chemical Engineers Financial, Mining, Industrial and Shipping Corporation
Mr. Vaos,	Geologist National Institute of Geology
THESSALONIKI	
Mr. L. Kritzidis	President Diana Company (Import and Trade of Agricultural Chemicals)
Mr. C.I. Santorineos	Marketing Specialist Diana Co.
Mr. V. Poling,	Project Manager, Salonika Industrial Area and Industrial Estate, UNIDO

Annex V

Reports made available to the Mission

1. Greece, Investment Opportunities, published by the Hellenic Industrial Development Bank, 10 Fil. Venizelou Ave., Athens 134 (1969)

2. Summary Report on the Possibility of Establishing an Agrochemicals Industry in Greece by Michael Bergoulos, 1971

3. Bulletin Mensuel de Statistique du Commerce Extérieur, Septembre 1970

4. Group Scalistiri, Technical and Financial Report, 1970

5. Bulletin on the Mining Activities of Greece for the years 1967-1968, Athens (1970)

6. Index of Ores and Minerals in Greece, published by GMIT, Athens (1971)

Annex VI

The Kingdom of Greece
Ministry of Agriculture
Division of Phytopathology

Quantities (Kgs) Pesticides used by Agriculture

Sold by		copper sulphate	sulphur	S-wettable	CuOCl	Hexachloro-benzene
1)1960	a)B.A.G.	7.991.000	12.[illegible].317	[illegible]5.223	5.[illegible]	[illegible].291
	b)C.PRIVS			30.029	77.[illegible]50	12.000
2)1961	a)B.A.G.	7.406.539	13.65[illegible].[illegible]99	27.307	13.000	.002
	b)C.PRIVS			65.025	120.673	30.000
3)1962	a)B.A.G.	5.[illegible]2[illegible].770	12.45[illegible].536	11.[illegible]0	23.407	[illegible].672
	b)C.PRIVS			53.020	[illegible]0.000	1[illegible].[illegible]10
4)1963	a)B.A.G.	7.277.291	13.610.123	41.235	45.157	[illegible].250
	b)C.PRIVS			0.[illegible]52	24[illegible].740	[illegible]4.140
5)1964	a)B.A.G.	6.757.[illegible]12	14.743.[illegible]80	[illegible]33.[illegible]00	85.005	2.274
	b)C.PRIVS			114.[illegible]00	225.5[illegible]1	32.[illegible]50
6)1965	a)B.A.G.	5.251.404	15.7[illegible].286	3[illegible].[illegible]47	[illegible]9.045	7.654
	b)C.PRIVS			153.511	233.190	41.[illegible]50
7)1966	a)B.A.G.	4.791.[illegible]73	13.313.242	35.[illegible]87	104.53[illegible]	5.536
	b)C.PRIVS			100.354	152.[illegible]90	[illegible]3.2[illegible]0
8)1967	a)B.A.G.	4.207.307	17.502.371	[illegible]50.[illegible]30	322.102	5.417
	b)C.PRIV			7[illegible].700	12[illegible].100	42.420
9)1968	a)B.A.G.	3.6[illegible]5.231	20.74[illegible].73[illegible]	[illegible]31.143	115.[illegible]10	4.[illegible]37
	b)C.PRIVS			10[illegible].620	11[illegible].252	55.4[illegible]0
10)1969	a)B.A.G.	3.[illegible]69.4[illegible]2	21.7[illegible]7.224	32.700	121.674	[illegible].07[illegible]
	b)C.PRIVS			115.101	122.00[illegible]	5[illegible].254
11)1970	a)B.A.G.	4.000.000	23.000.000	34.3[illegible]5	127.757	[illegible].3[illegible]3
	b)C.PRIVS			17.2[illegible]5	12[illegible].300	[illegible]1.16[illegible]

Annex VI (continued)

Sold by		Organo-mercury fungicides (2-3 % mercury)	Lead arsenate	Active material	100% active material
1)1960	a)B.A.G.	1.015	51.425	4.582	2.175
	b)C.PRIV		69.500	12.000	28.250
2)1961	a)B.A.G.	1.351	41.049	4.582	4.100
	b)C.PRIV		47.500	22.000	1.345.453
3)1962	a)B.A.G.		12.701	6.019	
	b)C.PRIV		35.542	21.500	1.553.507
4)1963	a)B.A.G.	151	25.591	1.754	17.000
	b)C.PRIV		6.500	25.500	1.211.752
5)1964	a)B.A.G.		24.106	44	54.530
	b)C.PRIV		35.000	27.500	118.430
6)1965	a)B.A.G.		19.665	5.357	25.400
	b)C.PRIV		16.000	20.454	104.470
7)1966	a)B.A.G.		20.632	10.433	40.350
	b)C.PRIV		34.500	11.000	103.092
8)1967	a)B.A.G.		24.041	48.820	42.207
	b)C.PRIV		20.000	48.820	505.855
9)1968	a)B.A.G.		19.895	27.131	42.506
	b)C.PRIV	7.000	22.000	80.700	264.881
10)1969	a)B.A.G.		20.895	28.487	45.051
	b)C.PRIV	7.350	23.100	84.735	278.125
11)1970	a)B.A.G.		21.595	29.500	47.303
	b)C.PRIV	7.717	24.255	88.561	292.032

Annex VI (continued)

sold by		100 active material	Mineral Oil winter	summer	2,4 D and MCPA 100 active material
1)1960	a)B.A.G.			6.835	153.405
	b)C.PRIV.	163	55.000	294.128	122.775
2)1961	a)B.A.G.	206.447		45.504	119.755
	b)C.PRIV.		40.462	449.144	177.659
3)1962	a)B.A.G.		262	38.336	135.512
	b)C.PRIV.	303.615	141.960	617.274	99.309
4)1963	a)B.A.G.		72	141.629	76.081
	b)C.PRIV.	830.699	143.580	774.014	131.000
5)1964	a)B.A.G.	320.000 FOK	28.919	157.715	108.211
	b)C.PRIV.	3.514 I.	16.106	467.250	252.401
6)1965	a)B.A.G.		33.874	156.556	93.606
	b)C.PRIV.	242.400	75.286	913.435	273.603
7)1966	a)B.A.G.		70.636	182.963	96.493
	b)C.PRIV.	1.480	92.325	486.635	248.619
8)1967	a)B.A.G.		46.703	100.662	90.357
	b)C.PRIV.		341.015	480.263	
9)1968	a)B.A.G		32.806	185.009	72.940
	b)C.PRIV.	183.388	23.990	184.834	301.376
10)1969	a)B.A.G.		34.236	194.259	76.507
	b)C.PRIV.	192.557	25.189	194.075	400.444
11)1970	a)B.A.G.		35.947	203.981	80.416
	b)C.PRIV.	202.184	26.450	202.500	420.486

Annex VI (continued)

sold by		Potassium carbonate	Organic phosphorus esters			
			Dimecron	Parathion	Malathion	Diazinon
1)1960	a)B.A.G.	128.629		23.633		3.073
	b)C.PRIV.			50.027		1.200
2)1961	a)B.A.G.	490.115		23.614		314
	b)C.PRIV.			70.154	11.786	3.500
3)1962	a)B.A.G.	546.145		37.703		227
	b)C.PRIV.			113.780	18.997	4.000
4)1963	a)B.A.G.	616.353		41.954	1.365	41
	b)C.PRIV.			70.775	9.755	4.600
5)1964	a)B.A.G	581.806		56.365		330
	b)C.PRIV.			72.176	9.418	4.000
6)1965	a)B.A.G	817.640		39.801	240	746
	b)C.PRIV.			68.374	11.326	5.000
7)1966	a)B.A.G.	1.100.095		33.360	220	1.767
	b)C.PRIV.			50.657	22.355	7.600
8)1967	a)B.A.G.	931.442	70.516	32.722	149	2.753
	b)C.PRIV.		1.944	85.078	35.940	31.350
9)1968	a)B.A.G.	967.654	4.045	16.504	131	675
	b)C.PRIV.		24.000	92.327	54.362	11.400
10)1969	a)B.A.G.	1.016.038	4.247	17.329	137	700
	b)C.PRIV.		25.200	96.943	57.000	11.970
11)1970	a)B.A.G.	1.066.837	4.459	18.195	143	743
	b)C.PRIV.		26.460	100.790	59.934	12.570

Annex VI (continued)

sold by		organics phosphorus esters Metasistox 100/	Rogor 100/ Dimathoate	ethylene chlorohydrine	chlorinated Hydrocarbons D.D.T. 100/
1)1960	a)B.A.G.	503	8.961	1.918	113.234
	b)C.PRIVE	335			63.960
2)1961	a)B.A.G.	352	17.507	2.432	71.515
	b)C.PRIVE	521			206.999
3)1962	a)B.A.G.	550	4.112	2.449	90.064
	b)C.PRIVE	706			101.073
4)1963	a)B.A.G.	810	13.003	2.962	87.600
	b)C.PRIVE	1.004	1.000		137.129
5)1964	a)B.A.G.	1.542	9.000	3.101	81.596
	b)C.PRIVE	505	3.366		230.347
6)1965	a)B.A.G.	3.525	64.533	3.057	102.381
	b)C.PRIVE	4.684	3.837		103.560
7)1966	a)B.A.G.	4.449	13.646	3.074	107.022
	b)C.PRIVE	3.815	4.224		126.100
8)1967	a)B.A.G.	4.804	64.950	2.832	117.507
	b)C.PRIVE	5.811	3.664		172.[illegible]
9)1968	a)B.A.G.	722	8.551	2.745	120.532
	b)C.PRIVE	9.237	6.670		201.002
10)1969	a)B.A.G.	750	8.978	2.882	134.950
	b)C.PRIVE	9.69[illegible]	7.012		274.052
11)1970	a)B.A.G.	796	9.427	3.026	141.706
	b)C.PRIVE	10.102	8.363		277.755

Annex VI (continued)

sold by		Chlorinated Hydrocarbons B.H.C. mixed isomers 100%	Linden	Aldrin	Dieldrin	Cotton Dust 3-10-40	Mixture of Dichloroethane et Carbontel-Trachloride
1)1960	a)B.A.G.	6.670	635	10.777	1.147	151.575	8.305
	b)C.PRIVE	11.960	710	43.000	5.500	3.000	
2)1961	a)B.A.G.	5.350	1.230	7.023	1.524	105.577	11.756
	b)C.PRIVE	18.920	2.848	60.000	755	30.000	
3)1962	a)B.A.G.	6.566	610	13.446	1.630	96.336	20.000
	b)C.PRIVE	16.275	3.225	82.920	1.662	14.971	
4)1963	a)B.A.G.	3.457	4.188	31.082	965	129.405	11.327
	b)C.PRIVE	42.900	3.262	142.964	1.057	44.977	
5)1964	a)B.A.G.	4.854	765	33.909	927	130.020	6.991
	b)C.PRIVE	39.367	2.346	68.724	7.000	50.906	120.000
6)1965	a)B.A.G.	5.600	400	46.693	1.645	190.070	11.507
	b)C.PRIVE	29.900	4.550	50.000	2.500	34.970	
7)1966	a)B.A.G.	7.340	637	55.313	2.677	199.065	12.194
	b)C.PRIVE	39.194	5.833	105.150	5.500	30.000	
8)1967	a)B.A.G.	5.505	830	35.265	3.402	248.556	11.335
	b)C.PRIVE	31.320	4.337	90.000	3.500	20.000	
9)1968	a)B.A.G.	5.412	690	42.327	3.310	916.000	7.109
	b)C.PRIVE	41.864	9.168	88.825	8.130	600.000	
10)1969	a)B.A.G.	5.680	733	44.453	3.475	315.000	7.527
	b)C.PRIVE	43.957	9.626	93.200	8.536	300.000	
11)1970	a)B.A.G.	5.964	768	46.676	3.649	220.000	7.903
	b)C.PRIVE	46.155	10.107	97.929	8.963	300.000	

Annex VI (continued)

sold by		etaldehyde active	Pyranone	Ironsulphate
1)19 60	a)B.A.G.	1.640	10.442	113
	b)C.PRIVE	207	1.500	254.120
2)19 61	a)B.A.G.	1.141	7.602	209
	b)C.PRIVE	1.231	1.500	
3)19 62	a)B.A.G.	072	10.363	43
	b)C.PRIVE	1.377		
4)19 63	a)B.A.G.	1.464	8.274	170
	b)C.PRIVE	6.769		
5)19 64	a)B.A.G.	927	12.179	
	b)C.PRIVE	4.732		
6)19 65	a)B.A.G.	1.220	15.411	
	b)C.PRIVE	1.405		
7)19 66	a)B.A.G.	1.250	7.245	
	b)C.PRIVE	1.050		
8)19 67	a)B.A.G.	1.335	6.905	85
	b)C.PRIVE	3.525		1.000
9)19 68	a)B.A.G.	492	3.275	7
	b)C.PRIVE	4.145		
10)19 69	a)B.A.G.	516	3.439	10
	b)C.PRIVE	4.352		
11)19 70	a)B.A.G.	542	3.611	10.5
	b)C.PRIVE	4.570		

Annex VI (continued)

Sold by		Organo-mercury fungicides (2-3% mercury)		Heptachlor	Vapam	Phosphortoxin	Brestan
1967	a)B.A.S.			1.697	1.708	1.463	14.981
	b)C.PRIVE	10.966	10.000	7.963	12.117	30.862	1.500
1968	a)B.A.S.			3.810	2.265	73.300	9.465
	b)C.PRIVE			24.700	230.211	4.307	
1969	a)B.A.S.			4.000	2.370	77.040	9.930
	b)C.PRIVE			25.935	241.721	4.307	
1970	a)B.A.S.			4.700	2.457	80.901	10.435
	b)C.PRIVE			27.232	253.807	4.630	

Annex VI (continued)

Pesticides against Dacus Oleï

				Insecticides 100 active m	Proteines
1965	Dimethoate	37.500		37.500	
	Atropaz		100		
	Titan		100		
	Staley		300		500.000 KG
1966	Dimethoate	40.000			
	Dimecron	20.000			
	Anthion	17.000			
				77.000	
	Atropaz		640		
	Titan		310		
	Staley		350		1.100.000 KG
1967	Dimethoate	65.000			
	Anthion	30.000			
	Lebayeid	30.000			
	Malathion	10.000			
	Dipterex	5.000		140.000	
	Staley-Atropaz	M.C.	1.000.000		1.000.000 KG
1968	Lebayeid 50%	107.000			
	Malathion 96%	1.040			
	Dipterex 50%	42.000			
	Dithional 57%	29.000			
	Dimecron 40%	136.750		314.690	
	Atropaz		50.000		
	Titan 50		50.000		
	Titan 114		50.000		
	Rhodia		105.000		255.000 KG

Annex VI (continued)

1969	Atropaz	[illegible].T.	1.000
	Rhodia	[illegible].T.	50
	Ceratene	[illegible].T.	05
	Lebeyeid 50%	[illegible].T.	210
	Dithiomal	[illegible].T.	100
1970	Atropas	[illegible].T.	1.350
	Ceratene	[illegible].T.	100
	Termon127	[illegible].T.	50
	Dithiomal	[illegible].T.	7.5
	Lebeyeid	[illegible].T.	260

Annex VII

List of Pesticide Formulators and Products

Name	Address	Type of Products
1. Sulphur Hellas Co.	Factory: Corinth Office: Piraeous I Athens	S containing dusts
2. Agricultural Bank	Office: Panepistimion Ave. Athens	S and copper dusts
3. Shell Co.	Metropoleous 3, Athens	Summer oils
4. Hellas Chemical Products Co.	Amalias 20, Athens	Copper products
5. Diana Co.	Thessaloniki	Liquid and solid formulations of insecticides, fungicides and fertilizers
6. D.P.D.	Piraeous I, Athens	Household aerosols
7. Pispinis	Rhomistocleous 4, Athens	Household aerosols
Prospective Formulators		
8. BIOFARM	Three Bridges, Solouos III	Formulations of Swiss, French and US products
9. LAPHARM	Annandrou 73, Athens	Formulations of US products American Cyanamid Blanco Medical products
10. HELLAFARM	Annandrou 66, Athens	Formulations of Rhone-Poulenc products
11. UPIEL		Formulations of Bayer Products
12. Avthimiadis	Thessaloniki	Representing Murphy (U.K.)

Annex VIII

DRAFT

Request from the Government of Greece

for

Special Industrial Services

Job Description

Post Title: Pesticide Formulation and Analysis Expert

Duration: Two months with the possibility of extension to four months.

Date Required: As soon as possible

Duty Station: Thessaloniki and Athens

Purpose of Project: The expert will provide assistance in introducing modern instrumental testing, development and quality control methods and techniques required in the process of developing new formulations and selecting the proper and most economic carriers, diluents, surfactants and ajuvents.

Duties: The expert will be assigned to the Ministry of Economy, Division of Agriculture, Athens. He will perform, in co-operation with the counterpart research staff the following duties:

- Advise on methods and techniques used in the development of new pesticide formulations based on domestic carriers and diluents;
- Introduce advanced techniques in the selection of emulsifiers surface-active agents, wetting agents, stabilizers, etc.;
- Advice on the organization and planning of the research work and equipment required for this work;
- Provide scientific information on analytical techniques, international pesticide standards and pertinent bibliography.

Qualifications: Chemist or chemical engineer with broad experience in pesticide chemistry formulation and analysis.

Annex VIII (continued)

Language: English

Background Information: The demand for agricultural and household pesticides has grown at a rapid rate in Greece thus justifying the establishment of local pesticide formulation plants. Most of the formulators and distributors representing one or more foreign companies technically depend on the know-how made available by the foreign supplier of the active materials. Little is obtainable from abroad on techniques necessary for developing new formulations, utilizing local carriers, testing the stability and quality of the formulated end products. Companies and institutions interested in establishing their own testing and development facilities and processes would need more technical assistance preferably from an independent organization, in terms of methods and instrumentation of formulation research and development, standardization and quality control.

Annex IX

JOB DESCRIPTION

Post Title: Chemical Engineer (Production of copper sulphate)

Duty Station: thens Greece with trips within the country

Duration: Four months

Date Required: s soon as possible

Duties: The expert is expected to work for the inistry of griculture and the Hellenic Chemical Products and Fertilizer Company in examining the possibility of making copper sulphate from concentrated copper pyrite ores. His duties will include the following:

(1) to investigate the availability of raw materials for copper sulphate production i.e. roasted copper ores and sulphuric acid their quality and quantity;

(2) to study the market conditions of copper sulphate both for domestic consumption and export most probably for agricultural uses;

(3) to suggest manufacturing techniques for making copper sulphate from roasted copper ores;

(4) if the feasibility study is positive to draw up a general plan for setting up a copper sulphate plant based on the above and make an estimate of capital requirement, cost and profit for the suggested establishment.

Language: nglish

Qualifications: Chemical engineer with experience in copper sulphate production and feasibility studies of chemical products.

Background Information: There is a copper-pyrite deposit in the Peloponnesus (Hermioni) Greece with a copper contents of 3 . This is presently used in the fertiliser production processes of the Hellenic Chemical Products and Fertilizers Co. fter roasting the copper contents is enriched to 4 . The company exports this roasted concentrate (about 50,000 tons per annum) to West Germany while the country is importing the copper sulphate from abroad a substantial

Annex IV (continued)

amount of which comes from West Germany. 50 000 tons of roasted copper-pyrite concentrate of % is equivalent to 2 000 tons of elemental copper more than the requirement for agricultural uses. The selling price of the roasted copper-pyrite ores is fixed according to the actual copper contents and current world market price of copper.

The present project is designed for an expert to examine the possibility of making copper sulphate from roasted copper pyrite ores in order to make more profit for the country and to supply the market demand of copper sulphate.

Annex IV (continued)

SPECIAL INDUSTRIAL SERVICES

Project Data Sheet

1. Reference Data:

- Country: Greece
- Project Title: Feasibility study on the production of copper sulphate
- Project Number: - UNDP Ref:
  - UNIDO Ref:
- Origin and Date of the request:
- Purpose of the project: To study the feasibility of making copper sulphate from concentrated copper pyrite ores.

2. Background Information: There is a copper-pyrite deposit in the Peloponnesus (Hermioni) Greece with a copper contents of 3%. This is presently used in the fertilizer production processes of the Hellenic Chemical Products and Fertilizers Co. After roasting the copper contents is enriched to 4%. The company exports this roasted concentrate (about 50.000 tons per annum) to West Germany while the country is importing the copper sulphate from abroad, a substantial amount of which comes from West Germany. 50 000 tons of roasted copper-pyrite concentrate of 4% is equivalent to 2 000 tons of elemental copper more than the requirement for agricultural uses. The selling price of the roasted copper-pyrite ores is fixed according to the actual copper contents and current world market price of copper.

The present project is designed for an expert to examine the possibility of making copper sulphate from roasted copper pyrite ores in order to make more profit for the country and to supply the market demand of copper sulphate.

3. Description of the Project:

An expert will work for the Ministry of Agriculture and the Hellenic Chemical Products and Fertilizer Company in examining the possibility of making copper sulphate from concentrated copper pyrite ores. His duties will include the following:

1) to investigate the availability of raw materials for copper sulphate production, i.e., roasted copper ores and sulphuric acid, their quality and quantity

Annex IX (continued)

2) to study the market conditions of copper sulphate both for domestic consumption and export, most probably for agricultural uses;

3) to suggest manufacturing techniques for making copper sulphate from roasted copper ores;

4) if the feasibility study is positive, to draw up a general plan for setting up a copper sulphate plant based on the above and make an estimate of capital requirement, cost and profit for the suggested establishment.

4. Project Budget:

Components: Duration: Cost:

gency Overhead Costs:

5. Payment Approved:

....

for UNIDO for UNDP

date: date:

Annex X

D [illegible]

Request from the Government of Greece

for

Special Industrial Services

Job Description

Post Title: Specialist in Pesticide Production and Marketing

Duration: Three months

Date Required: As soon as possible

Duty Station: Ministry of Economy Athens with the possibility of local travel

Purpose of Project: The expert shall examine whether domestic production of selected organic pesticides is feasible in Greece, a development programme of great interest to the Government.

Duties: The expert will be assigned to the Ministry of Economy Division of Agriculture in Athens. He shall establish, based on available data and in consultation with Government officials industries and organization interested in the promotion of the domestic production of basic pesticides, the following:

1. Pesticides whose production is justified by the size of domestic and existing or potential export markets or by other reasons;
2. Availability of production and process technologies involved in the production of selected pesticides;
3. Comparative study on possible technologies;
4. Availability of local raw materials required in the production of those pesticides;
5. Patent status of pesticides selected for local production;
6. Economic analysis of production to determine the rate of return on and the required size of investment capital;
7. Extent of interest shown by foreign pesticide suppliers

Annex X (continued)

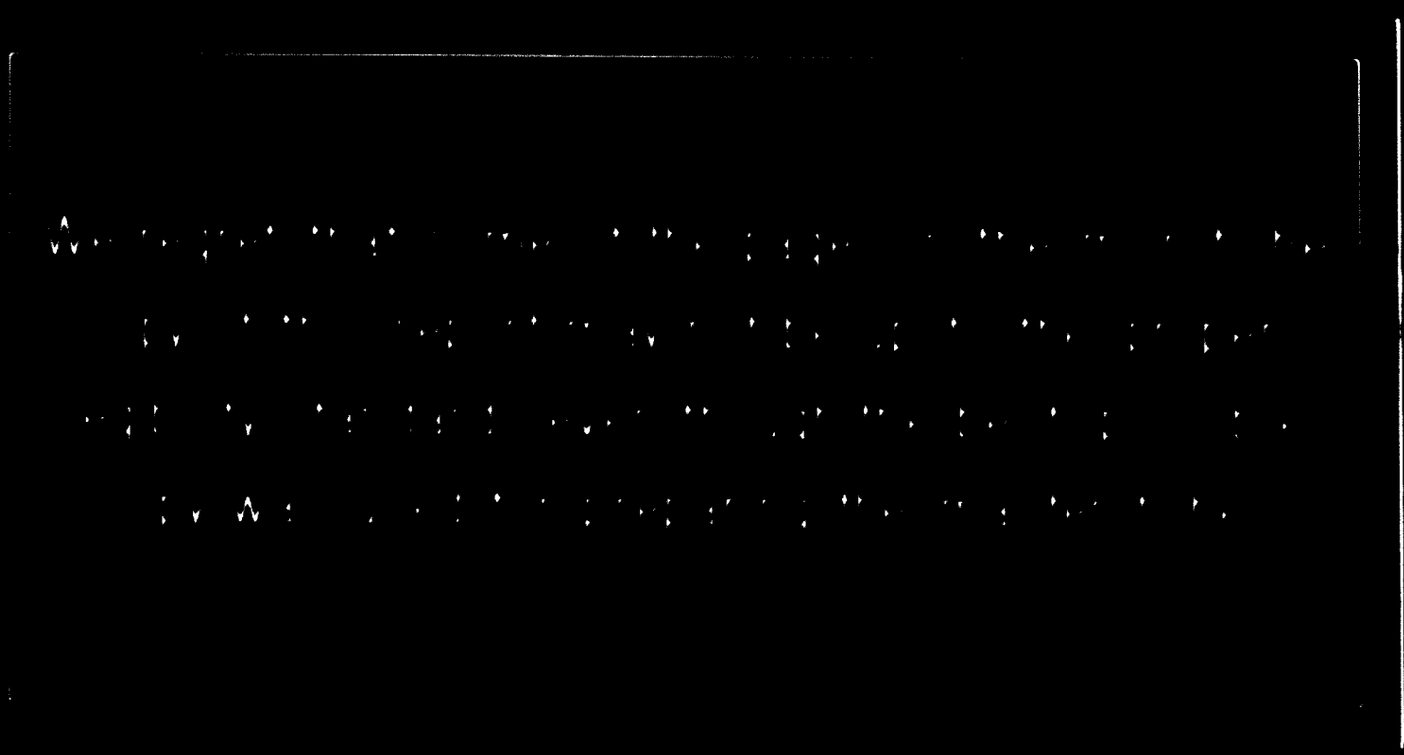
to assist Greece in establishing local manufacturing facilities;

C. Time schedule of construction and start-up periods.

Qualifications: Chemist(s) Chemical or Industrial Engineer(s) with experience in the chemistry and production of organic-phosphorus insecticides and chlorophenoxy-acetic acid herbicides and economic project evaluations.

Language: English

Background Information: Agricultural production is of about equal relative importance to the industrial production in Greece. Exports of tobacco olives fruits and vegetables play an important role in the trade with other countries as foreign currency earners, thus the protection of these crops against pests and diseases is of great concern. All pesticides used in Greece are presently imported draining the foreign currency reserves and rendering the country dependent on foreign supplies. At the request of the Government of Greece an exploratory mission by UNIDO recently established that currently the country is spending about US 17 million yearly on basic pesticide imports. The formulation, packaging and marketing of pesticides are gradually being solved by local industries. The Government would also like to encourage the local production of basic pesticides whenever feasible. The present study will have to develop economic and technical guidelines with this purpose.



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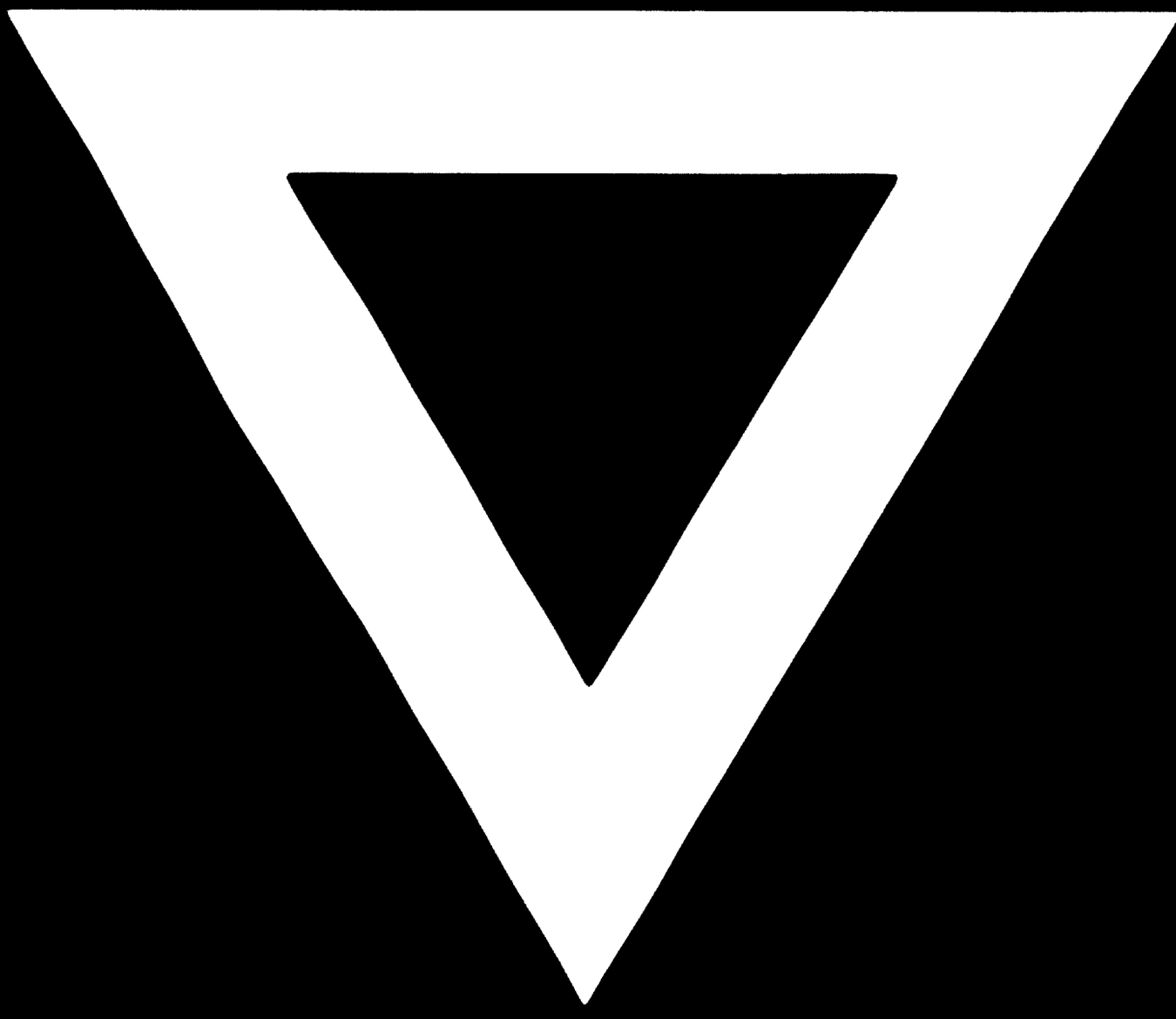

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