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16399

DP/ID/SER.A/867
9 July 1987
ENGLISH

PESTICIDE DEVELOPMENT PROGRAMME IN INDIA

DP/IND/80/037

INDIA

Technical report: Findings and Recommendations*

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

Based on the work of Dr. Wade Van Valkenburg
Expert on Pesticide Formulations

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United Nations Industrial Development Organization
Vienna

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ABSTRACT

Post : DP/IND/80/037/11-62/32.1.6
Title : Consultant in Pesticide Formulation
Objective : Advise and assist PDPI on the development of pesticide formulations
Period : 17.1.87 - 28.3.87

Conclusions and Recommendations (Summary)

The continued growth and acceptance of PDPI during the past year should reflect credit to the HIL management for their guidance and motivation and to PDPI for their enthusiasm, dedication and performance. Now, at this stage of growth, it is time for PDPI to become a society under the aegis of the Government of India; to extend its services to a broader spectrum of clients; to exemplify its performance by developing, perfecting, registering and introducing to the market place new concept pesticide formulations; to develop a plan of service to RENPAP; to diversify the utilization of its technology; and to continue to build on its technology base.

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Explanatory Notes:

UNDP (United Nations Development Programme) has extended into 1988 its sponsorship of PDPI (Pesticide Development Programme India). PDPI is managed by Hindustan Insecticides (HIL), a government of India Corporation. PDPI has a wide range of objectives dealing with the accumulation, usage and dissemination of pesticide formulation technology throughout the country.

This report covers the period of January 17, 1987 through March 28, 1987 while the writer, Dr. Wade Van Valkenburg, UNIDO expert on pesticide formulations, was assigned to PDPI which has its offices and laboratories at the HIL research complex at Gurgaon, a short distance from New Delhi.

This report marks the conclusion of Dr. Van Valkenburg's 1986 three-month contract which was extended for the purposes of this visit to a length of 4½ months; 2 months in 1986, 10 weeks in 1987.

ACKNOWLEDGMENT

The writer is very grateful to UNDP and PDPI for the opportunity to return to India for this past ten weeks, which constitutes a six weeks' extension of the original three month contract. The support, cooperation and enthusiastic efforts on the part of all the people here is humbly appreciated and one hopes that in some small way one has been able to respond by making some small contribution to the continued success of this project.

To any future reader who is contemplating service in India you will find no one in the world any more cooperative, more receptive to suggestions and more willing to work hard to achieve their goals. Service in India is a rewarding growth experience.

I express my special thanks for encouragement, support and cooperation to Dr. S.P. Dhua and Mr. M. Lal of HIL, to Dr. M.K. Hussein and Mr. Sat Pal of UNDP, to Dr. S.K. Khetan, Dr. P.K. Ramdas, Dr. R.K. Khandal, Mr. V.N. Dutta, Mr. S. Kumar and the others at PDPI.

Conclusions and Recommendations

Conclusions

1. PDPI continues to make significant progress as exemplified by the following accomplishments which have occurred during the past year:

- a) Dr. P.K. Patanjali, a very knowledgeable person in micro-emulsions, has been hired to back up Dr. Ramdas.
- b) Dr. B.N. Pandey, an analytical chemist from Union Carbide, has been hired to start PDPI's own analytical laboratory.
- c) Five other consultants have been brought in to continue the technical growth of PDPI scientists.
- d) Mr. Kumar and Dr. Khandal have each spent six months or more in study abroad to build their technical expertise
- e) The laboratory work associated with the BASF project is finished and compositions are out for field trial.
- f) The biocide project is making considerable progress and has achieved recognized status.
- g) The suspension concentrate project is well advanced and is moving into the pilot plant stage.
- h) PDPI has received additional recognition by being asked to conduct a three-day training Session for the Gujarat Pesticide Formulators' Association at Sardar Patel University.
- i) India, UNDP and PDPI were asked to host the RENPAP workshop.
- j) India has been asked to coordinate the activities of RENPAP.
- k) Close relationships are being established with the chemistry department of Sardar Patel University where a chair or financial support will be given to a faculty member teaching and doing research in pesticide formulation chemistry.
- l) And I'm sure there are more but these are the advances this writer is aware of.

2. Continued growth will not only require the continued accumulation and building of technology but increased emphasis on the transfer of that technology to both the private and public sectors.

Recommendations

1. Society Status: PDPI should become a Society, as defined by Indian Statutes. HIL management has been good for PDPI as they have had as an objective the creation of a good working environment for the talented scientists in PDPI. The prime reason for PDPI converting to Society status is one of image. HIL is a competitor to many of the potential clients of PDPI. By achieving Society status PDPI no longer will have the image of a competitor but one of a helper.
2. Increase of Technology Base: PDPI must never cease in its efforts to build its technology base. As a center of technology it must keep up with advances and stand ready to give this technology to those that need it. One way to accomplish this is to increase PDPI's interactions with Universities and other institutions of higher learning. The interaction with the chemistry department at Sardar Patel University should be implemented and utilized to its maximum. Relationships with one or two more academic institutions should be initiated. Then, as part of these relationships, a one semester applied education and training course should be established at Gurgaon for students who are majoring in pesticides or pesticide formulations. PDPI scientists should be encouraged to give guest lectures at these academic institutions.

Technology should be accumulated by greater attendance at significant pesticide chemistry meetings such as IUPAC, ASTM, Beltsville Conferences and the Brighton Conference (British Plant Protection), particularly plans should be formulated for a significant number of PDPI personnel to attend the Seventh International Congress on Pesticide Chemistry in Hamburg, Germany in 1990.

3. Development: Performance is the best builder of reputation. PDPI has done well with its training Sessions and workshops. The industry appears to be keenly interested in new technology and PDPI's successful development of a flowable is causing a lot of excitement. Other flowables, microemulsions and dispersible granules should be developed and introduced

to the industry as rapidly as is feasible.

4. Spin-off Technology: The utilization of technology is not restricted to a given field such as agriculture. Dispersion technology is applicable to coal slurry research, for example and the generation of an electrostatic charge on spray droplets is useful in a painting operation. PDPI should continue to explore the utilization of these "spin-offs" as a means of broadening its client base.

5. Screening: To date, in India, only one biologically active compound has been discovered (Union Carbide) through screening. Yet many new compounds have been synthesized in this country, particularly in academic institutions. The Dow Chemical Company is interested in obtaining compounds from various sources and conducts screening tests for biological activity. They can conduct fifty or sixty tests on as little as two grams of material.

This recommendation is that I will seek from Dow a potential contract for screening which PDPI could review. If acceptable PDPI could then act as a clearing house for compounds from academic institutions for this screening program. This will give PDPI greater interactions with Universities and will help India develop more indigent technology.

6. RENAPAP: India will now have the role as coordinator for the RENAPAP programme. During these early formative stages the role that PDPI will play and the manner in which they may be of service should be clarified.

7. Service to the Industry: PDPI should consider ways and means of increasing their service to the industry. A couple suggestions follow for their consideration:

a) It has been said that upon inspection, 25% of the pesticidal formulations in India are found not to meet ISI specifications.

Perhaps an arrangement could be made whereby the analytical laboratory conducting the inspection could notify PDPI of non-conforming results. Then PDPI could offer their services to the company to solve their problem.

b) One visit to a small-scale formulator showed serious breaches of safety procedures. If there is an agency of the Government of India that conducts safety inspections, violations could be called to the attention of PDPI who could again offer their services to that formulator to improve their performance.

c) Full blown training sessions may not always be desirable for various members of the pesticide formulations industry. Perhaps PDPI should consider publishing a list of speakers and topics and indicate that these speakers are available to come to the requesting organization.

8. Biocide Formulation: This is a more specific recommendation than the previous ones. Currently the Bacillus sphaericus is ground in alcohol and then formulated. This has two specific drawbacks. First, it becomes a two-step formulation process rather than a possible one-step. Secondly, when the biocide is formulated and cast as a film on water, the alcohol is extracted by the water causing the film to lose structure and in some cases make a broken lens formulation. A suggestion is that the biocide should be formulated in a one-step process by grinding in the presence of all ingredients. The ingredients should include water, diethoxylated isostearic acid, an invert emulsifier and the biocide. This formulation when placed on water will form a semi-solid film that will entrap mosquito larvae.

Of very great concern is the reproducibility of the biocide as produced. Of course the strength will be gauged by a biological activity assay. However, PDPI should develop some analytical tests that give an indication of the reproducibility of different batches of biocide. A suggestion is that the biocide should be extracted with an aromatic solvent, a hydrogen bonding solvent, such as ethyl acetate, and an

aliphatic solvent. Either an infrared pattern or a chromatograph should be run on each extract to compare the extracted solubles in each batch.

9. Safety: If PDPI is to become an example for the rest of the pesticide formulation industry, they must apply upto date safety practices. This should include fume hoods in the laboratories, safety showers, eye wash fountains, fire extinguishers, fire blankets and liberal availability and use of safety glasses and safety shields.

Activities

1. Society Constitution and Bylaws

..... In one of the conclusions mention was made that it was time that PDPI became a society under the aegis of the Government of India. Attached is a copy of a proposed registration letter, constitution and bylaws for such a society. These proposed documents are starting points that should be refined and improved as all appropriate parties review them.

2. Gujarat Pesticide Formulators' Association

..... PDPI was invited to give a three-day seminar on pesticide formulations to the Gujarat Pesticide Formulators' Association at Sardar Patel University, Anand, in Gujarat State. The writer gave two lectures as follows.

a) Advances in Pesticide Formulations: This key note lecture included brief summaries of seventeen papers given at the Sixth International Congress of Pesticide Chemistry at Ottawa, Canada in August of 1986. The objective of this lecture was to demonstrate what technology is being developed in other areas of the world.

b) Emulsion Technology: This was a primer lecture on the role of emulsifiers in emulsification technology and their physical and chemical properties.

3. Regional network for Production, Marketing and Control of Pesticides for Asia and Pacific (RENAP), New Delhi, March 9-27

Four lectures were given in this workshop plus chairing two of the morning sessions. Comments about each of the four lectures follow:

a) Relevance of Pesticide Formulation Technology to our times

This address, given during the RENAP inaugural ceremony, discussed the role of development centers, such as PDPI, play in the transfer of technology to the consuming public. The entire process of technology transfer was elaborated as well as problems and potential solutions.

b) Advances in Formulation Technology

This paper covered the IUPAC plenary lecture and three significant technologies that represent areas of greatest interest to pesticide formulators around the world. The plenary lecture contained the four motivational forces that affect pesticide R&D. The three technical developments covered suspension concentrates, emulsion concentrates and the enhancement of activity of systemic fungicides.

c) Colloid Chemistry and its Relevance to Pesticide Formulations

This lecture emphasized the importance of surface tension to all pesticide formulations and the application of these to foliage. In the introduction three fundamental laws of surface tension were explained; Gibbs' surface excess, Kelvin's vapor pressure laws and Young's wetting equation.

d) Controlled Release Formulations

The various methods of achieving controlled release of pesticides were explained as well as mechanisms of release. Although

the advantages of controlled release were elaborated, the audience was cautioned concerning the limited commercial success of these type of formulations. A rigorous analysis of costs versus consumer benefits must be conducted on each proposed formulation.

4. Coal Project: Department of Energy

On Tuesday, March 24, Dr. Dhua, Dr. Khetan and the writer met with officials of the Department of Energy. PDPI has considerable expertise in the dispersion of solids in liquids. India has an interest in developing coal slurries (70% coal) that can be directly used as a fuel. The visit was to find ways and means of using PDPI's established expertise in this peripheral area of technology. At the time of this writing the results of this visit were not known.

Conclusion

It is a great honour and privilege to come to India to work with personnel from UNDP, HIL and PDPI in the advancement of the PDPI project. Considerable progress has been made and I anticipate continued advances during the oncoming years. Society status and greater interactions with the formulation industry will enhance this growth.

MEMORANDUM OF ASSOCIATION

PER SOCIETIES REGISTRATION ACT 1860

Institute for Pesticide Formulation Technology (IPFT)

A Government of India Society

The following persons

hereby associate themselves into a Society to be known as the **Institute for Pesticide Formulation Technology** and do hereby submit this memorandum of association to the Registrar of Joint-stock Companies and pray that he shall certify under his hand that the Society is duly registered under the Societies Registration Act, 1860.

The objects of the Society shall be to encourage in the broadest and most liberal manner the advancement of pesticide formulation research and development; the promotion and transfer of pesticide formulation technology to the industrial sector; the improvement of the qualifications and usefulness of pesticide formulation chemists and engineers through high standards of professional ethics, education, and attainments; the increase and diffusion of pesticide formulations knowledge; and by its meetings, professional contacts, reports, papers, discussions, and publications, to promote scientific interests and inquiry, to promote the utilisation of technology developed in pesticide formulations research and to enhance public awareness of enhanced technology and its values, thereby fostering public welfare and education, aiding the development of our country's industries, and adding to the material property and happiness of our people.

The Institute for Pesticide Formulation Technology shall have power, in compliance with the Societies Registration Act 1860 and under the direction of the Ministry of Industry, to make its own constitution, bylaws, rules and regulations and to perform all matters needful and useful to promote the objects of the Societies. As soon as possible after registration of the Society and selection of the officers and directors by the Ministry of Information, the Directors of the Society, or a majority thereof shall meet at the PDPI Centre, HIL R&D Complex, Gurgaon, Haryana, by notice served in person to each Director at his place of employment. The Directors shall organize and proceed to adopt a set of bylaws and on behalf of the Society receive, take over and enter into possession, custody, and management of real and personal property. The Society may from the time of the commencement of this meeting, and not prior thereto, assume liabilities and obligations for property procured in the interest of the Society meeting its objectives.

Respectfully submitted.

Signatures

Title

INSTITUTE FOR PESTICIDE FORMULATION TECHNOLOGY

Constitution

Article I

Name

Section 1:

The Society shall be known as the Institute for Pesticide Formulation Technology (A Government of India Society).

Article II

Objects

The objects of the Society shall be to encourage in the broadest and most liberal manner the advancement of pesticide formulation research and development; the promotion and transfer of pesticide formulation technology to the industrial sector; the improvement of the qualifications and usefulness of pesticide formulations knowledge; and by its meetings, professional contacts, reports, papers, discussions, and publications, to promote scientific interests and inquiry, to promote the utilization of technology developed in pesticide formulations research and to enhance public awareness of enhanced technology and its values, thereby fostering public welfare and education, aiding the development of our country's industries, and adding to the material property and happiness of our people.

Section 2:

To foster the improvement of the qualifications and usefulness of pesticide formulation scientists the Society shall be concerned with both the technology of pesticide formulations and its practitioners.

Section 3:

To foster the objects specified in this article, the Society shall interact with knowledgeable individuals on an international basis and shall be concerned with the application of pesticide formulation technology and peripheral utilization in India and shall be available for consultation and guidance to organization in Asia and the Far East such as the "Regional Network for Production, Marketing and Control of Pesticides in Asia and the Far East" RENPAP.

Section 4:

Objects of the Society may be modified by a vote of three-fifth of those voting at an annual meeting and subsequent ratification by the Board of Directors.

Article III
Composition of the Society

The Society shall be composed of members and a Board of Directors which shall be the administrative body that carries out the policies set by the Government of India through its Ministry of Industry.

Article IV
Membership

Section 1:

The members of the Society shall be those Corporations, Government sponsored units, small sector companies and individuals who are interested in the objects of the Society, paid a subscription fee and who meet the requirements for members as provided by the bylaws.

Section 2:

No person shall be entitled to vote or to be counted as a member whose subscription at the time shall have been in arrears for a period exceeding three months.

Article V
Officers

Section 1:

The offices and officers of the Society shall be determined by the Government of India through its Ministry of Industry.

Section 2:

The duties of the officers of the Society shall be such as usually pertain to the offices held and any other duties delegated by the Board of Directors.

Section 3:

All officers will take office on January 1st and shall hold office for two years or until their successors qualify.

Article VI
Board of Directors

Section 1:

The Board of Directors will consist of seven members of the Society selected by the Government of India through the Ministry of Industry.

Section 2:

The Board of Directors shall hold not fewer than four meetings annually and may hold additional meetings, on reasonable notice, upon the call of an

officer of the Society, upon a written request by three members of the Board of Directors, or by request of the Ministry of Industry.

One of the Board of Directors' meetings will be held in conjunction with the annual meeting of the Society.

Section 3:

The Ministry of Industry, Government of India, shall select the individual who will serve as the chairman of the Board of Directors.

Section 4:

The Board of Directors shall, once in every year, by the fourteenth day succeeding the general annual meeting of the Society, file a list of the names, addresses and occupation of the Directors, of the Society with the Registrar of Joint-stock Companies.

Section 5:

Whenever it shall appear to the Government of India that it is advisable to alter, extend, or abridge the objectives of the Society or to amalgamate the Society either wholly or partially with any other Society, the Board of Directors may submit the proposition to the members of the Society in a written or printed report, and may convene a special meeting for the consideration thereof according to the regulations of the Society;

But no such proposition shall be carried into effect unless a report and meeting notice shall have been delivered or sent by post to every member of the Society ten days previous to the special meeting to be convened by the Board of Directors for the consideration thereof, nor unless such proposition shall have been agreed to by the votes of three-fifths of the members delivered in person or by proxy, and confirmed by the votes of three-fifths of the members present at a second special meeting convened by the governing body at an interval of one month after the former meeting.

Section 6:

The term of office of each member of the Board of Directors shall be three years.

Section 7:

Any statement purporting to express the position of the Society on any public matter shall require the approval of the Board of Directors to be official.

Section 8:

A quorum of the Board of Directors shall be four and votes will be affirmed by a majority of those present.

Section 9:

In case of a vacancy in the Board of Directors the Chairman may appoint a member of the Society to a temporary seat on the Board to hold office until

the seat is filled by the Government of India. In the event the vacancy is in the office of Chairman of the Board, the Board of Directors will meet and elect a temporary Chairman of the Board, who will hold office until such time as the Government of India appoints a permanent Chairman.

Article VII

Publications

The Society shall issue or sponsor such publications as in the judgement of the Board of Directors will best carry out the Society's objectives.

Article VIII

Meetings of the Society

The Society shall hold one annual meeting and such other meetings as are necessary to carry out its objectives. The meeting will be called by the Board of Directors and shall be held in September, October or November in any given year.

Article IX

Finances

Section 1:

Each member of the Society shall pay dues as provided in the bylaws.

Article X

Bylaws

Section 1:

Any group of five members may propose new bylaws or amendments to existing bylaws not in a conflict with the constitution. Said proposed bylaws must be approved by a majority of the members voting at an annual meeting and thereafter must be approved by the Board of Directors.

Article XI

Amendments to the Constitution

Any group of five members may propose modifications of the constitution. Said proposed amendments must be approved by a two thirds majority of those voting at an annual meeting and thereafter ratified by a majority of the Board of Directors, and approved by the Government of India.

Article XII

Dissolution

If the Government of India should determine that the Society shall be dissolved forthwith, or at the time then agreed upon, and all necessary steps

shall be taken for the disposal and settlement of the property of the Society, its claims and liabilities, according to the rules of the said Society applicable thereto, if any, and, if not, then as the Board of Directors shall find expedient, provided that, in the event of any dispute arising among the said governing body or the members of the Society, the adjustment of its affairs shall be referred to the principal Court of original civil jurisdiction of the district in which the chief building of the Society is situated and the Court shall make such order in the matter as it shall deem requisite.

Section 2:

If upon the dissolution of any Society there shall remain, after the satisfaction of all its debts and liabilities, any property whatsoever, the same shall not be paid to or distributed among the members of the said Society or any of them, but shall be given to some other Society, to be determined by the Government of India.

Article XIII

Liability

The Society may be held liable as a Society for its acts and accordingly may sue or be sued.

INSTITUTE FOR PESTICIDE FORMULATION TECHNOLOGY (IPFT)

Bylaws

Bylaw 1

Membership

Section 1: Corporations, representatives of governments, laboratories, libraries, individuals and any others who are involved in pesticide information, education, science, technology, manufacture, marketing, sales, use or allied activities are eligible to become members of the Society.

Section 2: There shall be two classes of membership (i) Corporate and Government and (ii) small sector and individual.

Section 3: Organizations or individuals may become members by requesting membership in writing to the Board of Directors, paying the appropriate fees and receiving approval and notice thereof by the Board of Directors.

Section 4: Members shall be suspended from membership when they are more than three months in arrears on their dues, and dropped from membership after one year.

Section 5: Members may be reinstated to membership upon payment of their annual fees plus a penalty payment equivalent to 20% of their annual fees.

Section 6: A corporate and Government membership shall be any corporation or government sponsored unit whose sales or operating budget exceed one crore rupees or its equivalent per year.

Section 7: A small sector or individual membership shall be any small sector company, self-employed individual, student, or individual employed by a non-profit organization or organization with sales or budget less than one crore rupees or equivalent.

Bylaw 2

Membership Fees

Section 1: Fees are due and payable at the time of request for memberships or January first for membership renewal.

Section 2: Requests for membership after July first of any year will be for the current calendar year and will be for half the annual rate.

Section 3: Corporate and Government membership fees shall be at 500 rupees or equivalent per annum.

Section 4: Small sector and individual membership fees shall be at 100 rupees or equivalent per annum.

Bylaw 3

Manner of Election

Section 1: For any given position determined by the Government of India to be filled by election, on or before thirty days prior to the annual meeting any member may submit his own name or of any other member in writing (supported by the signature of five members of the Society) to the Board of Directors who will then place that individual's name in nomination for the office.

Section 2: The Board of Directors will nominate, subject to the individual's approval, sufficient candidates so that there are a minimum of two candidates for each position to be filled by election.

Section 3: Election shall be by a majority of votes cast at an annual meeting. If one candidate does not receive a majority the votes cast, a second ballot will be conducted amongst the candidate receiving the two highest number of votes.

Bylaw 4

Publications

Section 1: The Society will administer publication of a quarterly journal on pesticide formulations R&D and send a copy of said publication at no extra charge to all members of the Society.

Section 2: A subscription price for non-members for the quarterly journal on pesticide formulations R&D will be set by the Board of Directors in conjunction with the publisher.

Section 3: The Society may publish any such additional materials that will aid the Society in meeting its objectives.

Bylaw 5

Meetings

Section 1: The Society shall have an annual meeting at any time during the months of September, October or November of any calendar year. The meeting shall be held for the purpose of electing officers of the Society voting on proposed constitution and bylaw changes and such other business as is proper and consistent with the objectives of the Society.

Section 2: The annual meeting may be held in conjunction with a technical meeting of a sort consistent with the Society's objectives.

Section 3: The Board of Directors' meeting held in conjunction with the annual meeting will be held at the conclusion of the annual meeting or within two days thereafter.

Section 4: The Society may sponsor such additional meetings that will assist the Society in meeting its objectives.

Section 5: The Board of Directors will set the registration fees for meetings of the Society wherein members will pay not more than 75% of the registration rate for non-members.

Bylaw 6

Contract R&D

The Society may accept and carry out contracted R&D services. For each contract there shall be a proposal detailing of the R&D to be conducted and an approximate time schedule, charges for the contract work as set by the Society's Board of Directors, acceptance of the terms of contract by an officer of the Society and an officer of the requesting body and a detailed report describing the results of the contract work. The detailed report must be completed within six months of the completion of the contract work.

Bylaw 7

Finances

Section 1: All income to the Society shall be collected by such officers or officers as the Board of Directors may designate for that purpose.

Section 2: The Board of Directors is authorized and empowered on behalf of the Institute for Pesticide Formulation Technology to receive, by devise, bequest, donation, or otherwise, either real or personal property and to hold the same absolutely or in trust, and to invest, reinvest and manage the same and to apply said property and the income arising therefrom to the objects of the Society. The Board of Directors also shall have the power to allocate the funds of the Society for the purpose of carrying out the objects of the Society.

Section 3: Nothing in the Constitution or Bylaws of the Society shall be interpreted in any way that would inhibit or preclude the Society from soliciting funds from other agencies, Societies, organizations to support the activities of the Society directed towards meeting the objects of the Society.

Bylaw 8

Amendments

Any petition for amendment to these Bylaws shall be subject to the procedure outlined in the Constitution, Article XI, Section 1.