The Role of Information and Training in the Efficient Use of Fertilizers and Pesticides

Central notion

The notion of efficiency, as regards the use of fertilizers and pesticides, has evolved considerably over the past few years, with a growing awareness of the importance of economic factors, most particularly the energy-saving requirement in every area of agricultural production.

Whichever part of the world is considered, such an imperious necessity tends to lead to a questioning of the organizational patterns that govern the implementation of cultural techniques.

In a general atmosphere where, like it or not, ecological implications cannot be set aside, the strength of the notion of "integrated pest control", connected with the forms and conditions of the use of pesticides, takes on considerable dimension.

It is remarkable to note that the rational use of fertilizers is associated, in people's minds, with the intelligent manipulation of substances designed for pest control.

Beyond the more or less sophisticated methods that may technically — if not socially — be implemented, the notion of threshold, in close connection with those of "useful" and "useless" (or harmful!), may be illustrated by the following figure, as regards application to agricultural pests.

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(**) Presented at the International Meeting "Towards a Second Green Revolution: from Chemical to New Biological Technologies in Agriculture in the Tropics" (Rome, 8-10 September 1986).
It is, on the whole, as has already been stated, the weighing of a decision that is of economic nature, though tinged with ecology.

Clearly enough, the approach that has been introduced here does not apply, at least over an initial period, when it is a matter of producing a maximum amount of food at all costs.

In every case, however, boomerang effects are to be feared; the hazards inherent in intensive and systematic use of chemicals (in orchards for instance) are now well-known in Europe, as is the consequence of adding important amounts of fertilizers, a vegetative imbalance due to luxuriance.

Towards an efficient use of products

It is our opinion, although the possibilities of achievements may differ considerably according to the level of training and information of farmers and the training and supervision staff (by which we mean, the staff in charge of advisory, technical and methodological backing), that the modern notion of integrated crop production should be a goal, even in a long-term perspective.

It is in this way that, stage by stage, short step or long step, an efficient progression will be accomplished, with an efficient use of fertilizers and pesticides.

Integrated crop production, a factor of efficiency

Although the following presentation hinges upon a rational use of pesticides, that is, integrated pest control, the same elements may be applied to fertilizers.

The concept of integrated pest control is based upon sufficient knowledge of the cultural environment. The OILB has defined it as follows: “control of pests and diseases employing all methods consistent with economic, ecological and toxicological requirements while giving priority to natural limiting factors and economic damage thresholds”.

The implementation of such a drive requires:

- the ability to recognize all principal pests and beneficial arthropods,
- a knowledge of the usual periods for risks of attacks in the area, which implies the availability of reliable indicators (sexual traps, previsional models for instance) and/or precise information on the local level,
THE TOLERANCE THRESHOLD NOTION

Infestation levels

- higher
  - NO-TOLERANCE zone

- lower
  - UNCERTAINTY zone
  - General NO-RISK zone

Fig. 1

THE DEFINITION OF THE INTEGRATED PEST CONTROL (OILB)

"CONTROL OF PESTS AND DISEASES EMPLOYING ALL METHODS CONSISTENT WITH ECONOMIC, ECOLOGICAL AND TOXICOLOGICAL REQUIREMENTS WHILE GIVING PRIORITY TO NATURAL LIMITING FACTORS AND ECONOMIC DAMAGE THRESHOLDS."

Fig. 2
TO BRING THE INTEGRATED PEST CONTROL INTO OPERATION, ONE MUST BE ABLE:

1. TO RECOGNIZE PESTS
2. TO RECOGNIZE BENEFICIAL ARTHROPODS
3. TO KNOW THE PERIODS OF RISKS AND ATTACKS
4. TO DISPOSE OF RELIABLE INDICATORS
5. TO MAKE MEASUREMENTS ON THE FIELD
6. TO KNOW THE TOLERANCE THRESHOLDS
7. TO USE SELECTIVE PEST CONTROL PROCESSES

DIFFICULTIES IN THE INTEGRATED PEST-CONTROL DIFFUSION

INSUFFICIENCY OF:

- THE NUMBER OF ADVISERS AND RESEARCH WORKERS
- THE TECHNICAL ASSISTANCE
- THE MEANS OF TRAINING
- THE FINANCIAL SUPPORTS
— carrying out rapid and simple measurements on the fields, at the critical times established through the various risk indicators,
— referring to the tolerance thresholds (they are, in fact, intervention thresholds),
— using the most selective pest-control processes (cultural, biological, genetic, chemical), so as to achieve sufficient efficiency in fighting a given pest, while sparing beneficial arthropods as often as possible.

As has already been stated, pest control still relies largely upon pesticides, and the expression “reasoned pest control” has been agreed upon, in order to describe the stage of approach of integrated control which essentially draws upon such chemical means, the correct use of which (amount, time of application) is conditioned by the result of an enumeration of the pests and their importance in the culture, in reference to the indicative thresholds established locally or regionally by the technical staff.

It would seem that, for the agents in charge of popularization of integrated control in the agricultural population, difficulties arise, whatever the country or type of production, as a result of insufficiency in:
— the number of research workers and advisers (both functions must be understood in a broad sense),
— the technical assistance and means of training,
— the financial support of the State.

It may be noted that all this has to do with institutions rather than with people.

For the farmers, the range of difficulties would appear to be wider; it concerns mainly:
— an insufficient number of advisers,
— insufficient information, technical backup and means of training.

Whereas the principle of integrated pest control may seem to be well accepted, it is not the case as regards the observations that are to be carried out on the fields. It may be thought that such reticence is often the consequence of psychological factors.

The idea has been brought forth that one might resort to private services as far as the tests necessary to decision-making are concerned; there is a possibility for such developments in certain areas where the general organization and structure of farming concerns make it possible.

The refusal of an important risk of loss might also be brought forth; this seems a stronger position to take than the argument relative to an insufficient prospective gain.

It might be connected to the diffuse fear of an insufficient mastery of techniques and methods; hence the importance of technical assistance and training.
THE TECHNICAL INFORMATION OF THE AGRICULTURAL PUBLIC...

...A PROGRESSIVE PHENOMENON

INTRODUCTION OF REFERENCE PLOTS OF LANDS
INFORMATION AND PRACTICAL TRAINING OF TECHNICAL AGENTS
INFORMATION AND FORMATION OF FARMERS THROUGH
AGRICULTURAL ADVISERS
CONTINUOUS FURTHER TRAINING
EFFORT AT MAKING NON-AGRICULTURAL PUBLIC MORE
SENSITIVE TO THESE PROBLEMS

Fig. 5

THE INFORMATION MEDIA FOR THE AGRICULTURAL PUBLIC
(PARTICULARLY THE FARMERS)

COLLECTIVE INFORMATION:

TV, NEWSPAPERS, RADIO... GENERAL INFORMATION
BROCHURES, BULLETINS, MAGAZINES...
PARTICULARLY FOR TECHNICIAN-FARMERS

INDIVIDUAL INFORMATION:

AGRICULTURAL SUPPLIERS GATHER A GREAT ATTENTION
AGRICULTURAL ADVISERS CONSIDERED AS RESPONSIBLE
FOR POPULARIZATION
FARMERS AMONG THEMSELVES

Fig. 6
Importance of information and training

Such a course of action, which does not correspond to the broadcasting of a mere technique, but rather to that of an innovation liable to induce a change in attitude, requires:

- team-work,
- methodical, progressive and continuous action, following a plan that relies on local attitudes and behaviour.

Experience shows that regarding a given culture (or group of cultures), a promotional activity may only be considered once research and experimentation projects have been sufficiently developed, and in particular once simple and reliable measurement methods are available, as failure, even if it is partial, may entail heavy consequences, both on a financial and on a psychological level.

Once this preliminary observation phase — in which research workers, agricultural engineers and advisers will have taken part — is considered to have been accomplished, and only then, it is possible to reach the development stage. The general process may be as follows:

- introduction of reference plots of land (experimental cultures) in areas that are known to be difficult; the data obtained in laboratories and on experimental grounds is thus verified, and progressive adaptation is carried out;
- widest and most complete information of technical agents in charge of popularization;
- practical training of agents, in order for them to acquire a sound knowledge of the means and methods to be implemented;
- information of farmers; use of all available media; adaptation of messages to social environment and mental attitudes;
- efforts towards pre-development in the most receptive areas, through agricultural advisers and specialized agents, with the help, if possible, of research and economic services;
- continuous further training of Agricultural Council agents;
- extension, in successive approaches;
- in parallel, general information and efforts at making the non-agricultural public more sensitive to the issue through series of simple messages.

Information

The agricultural world is not homogeneous. Differences in mental attitudes are considerable. It is generally admitted that the assimilation of a new notion is obtained only little by little, step by step.

Therefore, the general situation is a complex one, which cannot, it seems, be reduced to one simple and universal principle.
FOR AN EFFECTIVE INFORMATION OF FARMERS

TO ADAPT AND TO SIMPLIFY AS POSSIBLE THE MESSAGE

TO USE THE WHOLE OF AVAILABLE MEANS OF INFORMATION

TO PRIVILEGE INDIVIDUAL RELATIONSHIP

TO PRIVILEGE THE DEMONSTRATION
Beyond such difficulties, daily exchanges allow for a perception of an attitude that is mingled with wariness and attraction for novelty on the part of farmers. From another point of view, a farmer may be seen to be in a receptive frame of mind:

- when he is rendered acutely sensitive by an immediate preoccupation.
- when the necessity of savings arises (on pesticides, fertilizers...) or when the perspective of a short-term profit is a strong one.

Finally, the producer, who has opted for specialization, will often show particular interest towards novelty, whereas those who practice mixed farming are frequently less particular, and technically less precise.

One message cannot reach all in the same way. Means of information are highly varied; they may be grouped into two large channels or systems:

- collective written information (newspapers, magazines and brochures, bulletins) or oral information (radio, television...),
- individual information, mostly oral, obtained from technicians, other farmers, as well as exchanges between restricted groups of farmers.

What could be said about the media currently used to convey technical information?

- Television, the radio, the press: they usually convey general agricultural information only. However, regional radio stations seem to be the best suited for conveying to farmers practical elements of information of local interest.

- Brochures, bulletins and magazines: such means of information are essentially of interest for the category of technician-farmers. Their audience, it seems, may only increase as technical training develops in a continuous way.

- Agricultural suppliers: they appear to gather great attention. A number of producers regard the "sales point" as the best source of interesting information.

- Advisers: they are often considered to be responsible for popularization; their action consists in direct intervention with the producers, so as to help them realize the best possible application of methods liable to improve technical and economic results.

Moreover, it should be noted that demonstration is a powerful factor in the development of a positive attitude. It allows farmers to judge the value of proposed innovations, and makes it possible to initiate an enriching dialogue between practitioner and technician.

Finally, some farmers and salesmen also play a determining part in the communication of information. In this peddling, a great broadcasting system, cutting across traditional commercial systems and relying on the whole cultural background and oral tradition, may not be as obsolete as is generally thought. A number of "peddlers" are liable to efficiently convey information or counter-information, especially when they belong to the group described by Americans.
as that of "opinion leaders", who are known to act as essential relays in the penetration of messages.

All of these more or less rival systems may actually be made to complement each other. It is our feeling that the whole of currently available means is not used in a rational way.

Altogether, evolution might well be slow, with the most significant progress depending on successive improvements rather than a revolution.

In any case, it seems necessary that:

— the message be well adapted, as simplified as possible, delivered in the farmer’s language, so as to make it readily understandable to the latter (see the diagram),

— a harmonious use of the whole of available means of information be attained,

— individual relationships be privileged.

But it must also be admitted that no fine studies are available to show what is perceived in information, how the message is "decoded" and "re-coded", what is retained in memory, and finally, what elements of the messages are efficient in inducing action.

Training

Training and other actions cannot be dissociated. The passage of innovation into agricultural practice must go through the stage of local reference plots of land (experimental) that will, in one place and with one team, allow to:

— give technical and economic proof of the innovation interest,

— give agents in charge of popularization and agricultural "leaders" practical training, by associating them to the experience-demonstration.

It should be borne in mind that this is long-term work, thus demanding much time and effort, and that the progressive nature of action regards advisers as well as producers.

In a more summarized way, one may say that such training can take highly varied forms. There are, however, constant elements:

— the need to rely on tangible results, that is, true-size demonstrations of what can be achieved,

— the need for training agents with a practical frame of mind, good skills and a good knowledge of the region and its people.

It seems important that one should insist on a good adaptation of the contents of the training, in order to meet the participants' legitimate expectations.

It is indeed only too often that preparation, on the educational level, seems to be improvised, and, moreover, that the level of methodological and technical contents is exceedingly high; this shows a manifest lack of adaptation, and, by way of consequence, induces relational difficulties between trainers and trainees.
On a local or regional level, the training of popularization agents and the producers who express motivation may be thought of in two very similar approaches: progressive action and intensive training courses.

A progressive training chart is established along the three following stages:

- inducing awareness (to the usefulness of a change in practices);
- introducing techniques and methods that are more efficient than those currently implemented;
- further training, as a subsequent phase.

An intensive training course may be reasonably considered only for people with general technical training and a good professional experience. It may also answer a limited goal of increasing the awareness of leaders. It must be backed up and continued by an important support on the part of local popularization agents.

In short

It is sometimes noted that well-tried methods, interesting for farmers, sometimes face great difficulty in penetrating the practical field.

The cause would seem to be of a psychological nature, as trying to communicate a technical message in an unprepared environment proves to be chancy.

Thus it is necessary, first of all, to convince addressees that the method introduced is real and efficient; this is the role of rational and sustained information.

Second, it is essential to make sure that training is carried out at every level, so that the "innovatory flow" may cascade down to the cultural environment.

Only at the cost of long efforts may practices evolve, even in the case of pesticides and fertilizers, as the supply of these is necessarily an important preoccupation for any farmer concerned with the profitability of his cultures.