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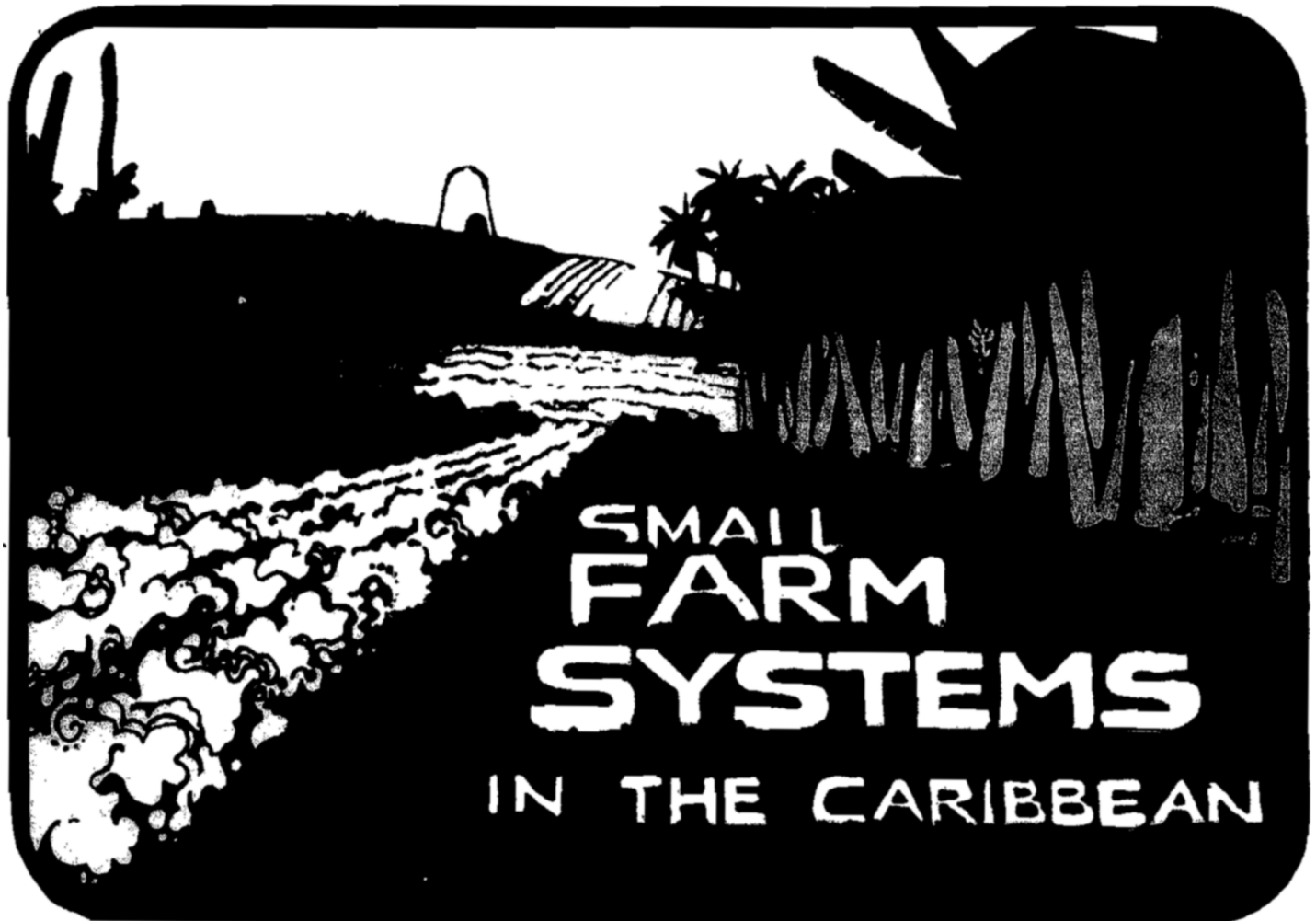
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Pest Management and the Vegetable Farmer in Trinidad and Tobago

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Trinidad and Tobago have historically not been big vegetable producers and during peak agricultural production, imperus was on estate cultivation. Traditionally, production has occurred on small farms found as isolated units or as subdivisions within larger acreages. Producers generally have no time and cannot employ labour required for well balanced pest management while maintaining profits. Local consumerism dictates the range and variety of vegetables cultivated.

Research is often not sufficiently relevant to field situations and transfer of technology does not seem very effective, resulting in unhealthy farming practices. More applied research, effective education of farmers and consumers, objectivity in selection for land distribution and training, central control of pest management, and greater incentive for motivating more people toward total dedication to agriculture are recommended.

The commercial vegetable grower in Trinidad and Tobago is relatively new in historic terms, as the islands have traditionally not been big vegetable producers. When Agricultural production was at its peak, the focus was on plantation crops such as bananas, citrus, cocoa, coconuts, coffee and sugar. Currently vegetable production is aimed at the local market and large quantities must still be imported to satisfy local demands. Vegetable farmers have traditionally worked small plots in contrast to the tree crop farmers. Even where vegetables are cultivated on large acreages such as in Aranguez, Pasa and Paramin, the holdings are divided into a number of subunits which may range from 0.05 to 12 ha in size. Recently there has been some interest generated in vegetable production in controlled environmental systems, but much of this is still quite experimental and geared for very select markets.

Vegetable growers cultivate a wide range of crops, choice being determined mainly by existing marketing conditions with little or no regard for anything else. A ban on importation of tomatoes and cabbages in 1981 led to an almost instantaneous increase in production of those commodities. Without benefit of any new technological development, a glut of those vegetables occurred on the market. Production has since been tailored to suit market demands while maintaining a price which is acceptable to farmers.

As stated previously, the average size of a single vegetable farm in Trinidad and Tobago is quite small. At present there is no real large-scale vegetable production. This situation does impose a number of constraints on a well planned pest management programme, particularly in areas of intense cultivation where the activities of each individual farmer affect the entire ecosystem. In the absence of integrated management of these estates, the farmer is free to follow his own path with little or no consideration for neighbouring farmers. The small, isolated vegetable producer is better able to manipulate the sequence of events in his system. This type of farmer is predominant in Tobago, whereas in Trinidad most vegetable producers cultivate in areas of intensive farming. This paper focuses on the major pest management constraints encountered by both groups.

Cultural Practices and Consumerism

As many as 65% of the vegetable farmers are otherwise employed, so that fewer than 35% produce crops exclusively. Use of intercropping and crop rotation as pest control strategies may be implemented by individual farmers, but usually all vegetable crop varieties which are cultivated occur throughout the year within a district. Thus, there is always a ready source of food for developing pest species, which may simply move from plot to plot. In addition, many farmers demonstrate little or no concern for fellow farmers. Because such a large percentage of farm workers are otherwise employed, little time is available for the valuable exercise of field sanitation, and crop residues are left standing until there is urgent need for the space which they occupy. Many farmers merely abandon their plots after high level infestations. The practise of clearing and burning after a crop has been harvested does not exist and it is not unusual to observe farmers dumping infested material in close proximity to their neighbours' plots. Crops such as melongene and pigeon pea are often left standing virtually unproductive in the field for considerable periods of time. Many problems, particularly those related to borers, occur during that phase of crop life and such plants become reservoirs of infestation for newly planted fields. Land preparation is usually not done properly and thus no accommodation for reducing pest populations occurs. Roguing is often perceived as a loss of potentially productive material rather than a reduction in infestation innocula. Cultural practices such as trapping, bagging, etc. are generally considered too time-consuming.

Some farmers, believing that the gamble will be in their favour, avoid carefully paring and treating of planting material while risking occurrence of serious outbreaks to which chemicals may be hastily applied. Regret is demonstrated only when the resultant loss becomes painful. Prophylactic measures are generally limited to pesticide application, as this is often the least time-consuming of pest control activities. Most planting material is imported and although there is some monitoring of seed quality, the small farmer sometimes receives supplies via suitcases and hand bags which usually escape security screening by quarantine officers. Crop selection is seldom a consideration. Many farmers

insist on growing particular crops regardless of the risks involved. Strategic planning does not take into account possible pest and disease outbreaks. Often crop choice depends solely on calculated marketing risks, pest problems being considered only after a crisis has arisen.

Vegetable farmers seldom risk cultivating anything exotic. They grow only those commodities for which there is a sure market, *i.e.*, they respond to dictates from the consumer population. Nonetheless, prices are dictated by the farmer who takes full advantage of the fact that within the population of Trinidad and Tobago demand is somewhat sure. Cost of inputs is therefore not a very limiting factor in production; excessive amounts of pesticide are often applied without regard to effect on the final cost. Over-fertilization is the norm, despite the fact that it may cause some disorders with consequent increase in susceptibility to pests and diseases. As the Trinidadian consumer develops more North American eating habits, the range of vegetable crops for which there is high demand is significantly reduced so that farmers now tend to grow the same limited set of crops throughout the year. Many of the crops which are in high demand share the same pests, making pest management more difficult.

Lack of processing and packaging industries forces all farmers to all aim production towards the fresh market. Thus, a morally unblemished product is always desirable and growers aspire to achieve this goal at all costs. The farmer is emotionally satisfied when he harvests an attractive looking commodity. This may colour his perspective in making realistic assessments of the economics of his situation. Most do not keep accurate records and do not yet realize that increased yields through use of new varieties do not always justify the costly inputs which are necessary to maximize such yields. Since the highest yielding varieties are invariably the most susceptible to pest attack, the time and expenditure needed for pest management should be carefully weighed against profits from the increased yields. Consumer taste largely determines farmers' selection of varieties for production. Sometimes farmers are forced to choose high risk varieties because of the physical appearance of the marketed commodity rather than the varieties' ability to tolerate environmental stresses. There has been, for example, an insistence on cultivation of Floradel tomatoes during the wet season rather than the more heat tolerant Roma variety.

Pesticide Usage

Pesticide application is the major, and in many cases the only, pest control strategy practiced since it affords farmers economy of time. Application techniques do, however, leave much to be desired. Accuracy of dosage is seldom a consideration as farmers simply cannot be bothered with tedious calibrations. Use of excessively concentrated mixtures thus becomes the norm, as does over application at unnecessarily high frequencies. In Trinidad, the pesticide market enjoys a tremendous degree of freedom and the absence of control has encouraged a situation in which the vegetable farmer has very easy access to all types of pesticides. Many formulations, such as granular carbofuran and aldicarb, are being used on crops such as lettuce and celery by farmers who respond firstly to well orchestrated sales techniques and later to their short-term observations of reduced evidence of pest damage. Long-term perspectives with respect to environmental sanitation and stability, or a healthy community are nonexistent.

The great variety of formulations currently available can be quite confusing to the average farmer, and a spontaneous generation of experts in pesticide technology occurs in most farming communities. Some farmers, while being familiar with trade or common names of pesticides, have absolutely no concept of the significance of the various formulations; an EC 50 formulation may be applied at the same rate as that recommended for use of the EC 20 formulation. The wide range of available application

equipment further complicates the process of accurate pesticide delivery. The quality of available equipment is also cause for concern. Proper quality control, more restricted importation, and insistence on adequate maintenance services may assist in alleviation of some of these problems.

An appreciable understanding of the natural enemy populations and their significance in pest management seems to be lacking among our vegetable farmers. Fear of losing a crop motivates them to spray anything which flies or crawls. This has led to development of a number of secondary pest outbreaks, resurgences and resistances within intensive vegetable growing areas. Examples include pin-worm outbreaks in the early 1970's, mole cricket resistances in the early 1980's and current mite and leaf miner outbreaks. Speed, rather than accurate and judicious methods of pesticide application, is the major priority. Farmers in Aranguez, for example, find it more convenient to apply Aldrin or Dieldrin by first saturating the dammed drains with the chemicals and then splashing buckets of the treated water some distance across the fields. In this manner, chemical application and irrigation occur in one operation, economy of time taking precedence over considerations such as economy of material, health of the worker and foliar toxicities. Pesticide application invariably occurs whenever the farmer has sufficient free time for the exercise. The influence of light and temperature sensitivities are seldom considered. Use of boots and other protective gear is usually viewed as an element which reduces speed. This fact, coupled with the physical discomfort created for the wearer in hot weather, has placed protective gear on the "negative list" of many farmers. Perhaps larger more highly mechanized vegetable farms would lend themselves more naturally to pesticide technology.

Because of the large size of pesticide packages, storage is a real problem for the small farmer and often results in a great deal of careless dumping and excessive application. Perhaps many of the problems involved in pesticide application could be avoided if farmers had the opportunity to purchase a pesticide control service provided by trained and licensed personnel. Since the farmers' greatest problem appears to be insufficient time to plan and implement sound pest management programmes, he might be able to concentrate on other areas of farm management if he were relieved of these responsibilities. Perhaps a reasonable pest control programme for the entire farming unit could be worked out, but legal control of land which has been distributed for agricultural purposes then becomes imperative. Centralized management of intensive areas of production may be beneficial.

Research and Transfer of Technology

Comparatively little research has been done in the area of management of vegetable crop pests in Trinidad and Tobago. Basic information on yield reduction, host ranges, seasonal population densities and geographic distribution is wanting, while applied research is heavily based on very short-term chemical control for farmer servicing. Farmers and others not able to appreciate the slow process of meticulous and precise data collection, frequently push extension officers into situations in which they must supply control information as instantaneously as do the agrosshop dealers. In the absence of detailed and critical assessments of individual problems, a series of misfortunes have occurred resulting in a lack of trust in both extension and research personnel. Generally the vegetable farmers maintain much more contact with agrosshop dealers than with professionals and eventually these dealers are perceived as the true experts in the field by both farmers and extension officers. This serves to reinforce the bias towards chemical application as the ultimate strategy in pest management.

Since effects of malpractices in pest management are usually not observed within the short term, farmers tend to disbelieve and ignore cautions expressed by professionals. Researchers in

Trinidad and Tobago have simply not been able to sell themselves or their work to the farming community. Even when significant research findings are presented, the information is not attractive to the farmer or to the population at large. Trinidadians, and to a lesser extent the Tobagonians, are culturally and socially conditioned to being entertained with flare and flamboyance. Research and extension personnel must understand and accept that fact if they are to ever make a significant impact on the farming population. A more colourful image could hardly hurt the agricultural researcher and use of more effective channels of communication can only enhance transfer of adequate technology.

Research objectives have not always been consistent with requirements and sometimes fluctuate with farmer demands rather than with farmer needs. Most farmer organizations operate as pressure groups with insufficient procedure for meaningful dialogue on technological development. This may give rise to irrational shifting in research priorities. Personnel involved in research related to vegetable pests are sometimes assigned to control programmes in the absence of adequate fundamental research. Much more collaboration among researchers and a more stable balance between field and laboratory investigation into problems which relate to pests of vegetable crops seems imperative.

Researchers and extension officers are usually moving against very strong currents in their attempt to encourage a well balanced and long-term view of pest management. The part time and sporadic nature of vegetable cultivation in Trinidad further compounds the problems of long range planning. Time spent on the farm site does not always coincide with working hours of professionals in the field. The electronic media must be utilized more often. An ongoing programme of farmer education has been organized by the Farmer's Training Centre of the Ministry of Agriculture, Lands and Food Production, but most small farmers claim that they cannot make the time to attend, and invariably participants are those who are already academically ahead. The strategy of taking training to the farmer has also been tried, but most are still unable to make the time needed for attendance. Even when the farmers have been trained, they find it extremely difficult to implement what they have been taught. There is deep-rooted fear of trying new methods and many feel relatively secure in their old practices. Despite a desire for higher levels of production there is some degree of comfort in known limitations. At any rate, their livelihoods are not totally dependent on farming and many farm only when it seems economically convenient. This group simply cannot invest time in educational programmes on pest management.

Because of the wide range of crops generally cultivated by an individual farmer, the volume of technical information which he must handle is inexhaustible. This is often a deterrent to the farmer who has limited time for education anyway. The absence of crop specialists in the production systems makes technological transfer difficult as training programmes must be quite general in order to attract a reasonably-sized audience. Within recent years, a new brand of vegetable farmer has been emerging in Trinidad and Tobago. This group consists of professionals from various fields, some of whom appear to have recognized the need for stable, well-managed production systems, and have an inclination to establish export markets and/or viable agro-industries. They generally attempt to work larger holdings with higher investment capital. Although they are quite responsive to training programmes, their lack of practical field experience has led to a

number of very basic farm management problems which has not helped implementation of pest management programmes. In addition, great skepticism exists within the group and they continue to hold tenaciously to their original professions. Greater incentives for total dedication to farming have to be provided.

A number of individuals have become involved in home gardening for a variety of reasons. Many see it merely as a new fad. Others are quite concerned about reducing food bills and eating uncontaminated foods. This group has responded quite enthusiastically to training programmes in pest management, but because of the great variety of training needs, courses are very generalized and basic. Invariably, pest management techniques which are designed for commercial farmers are applied to the home garden situation. Pesticides are being applied with quite a range of substitute equipment at excessive dosages resulting in outbreaks of secondary pests. This situation may be quite threatening to commercial farmers. In addition, training demands for home gardeners have risen drastically, perhaps to the misfortune of commercial farmers, some of whom have begun to be disgruntled. Although use of the electronic media has been quite effective in stimulating interest among home gardeners, there is certainly a much greater need for this medium to be explored as a channel for education of the larger commercial farmer.

Many who receive costly training demonstrate little devotion to agricultural development and the many problems encountered in altering pest management practices of traditional farmers, suggesting that greater objectivity in selection of target groups for training and land distribution is necessary. More training needs to be tailored for elementary and secondary school students who would be the agriculturalists of the future. Documentary films currently produced do not cater to these young students despite the fact that Agricultural Science forms an integral part of the curriculum of many schools. Agricultural Science teachers and extension officers have had little training in pest management practices, an area which appears to be somewhat neglected in the University's curriculum. There is obvious need for well-managed demonstration farms from which various types of people may learn, not only pest management strategies, but all skills related to successful vegetable production.

Conclusion

In Trinidad and Tobago, vegetables are produced on small farms, many of which are really extended backyard gardens. In an attempt to reduce the number of man hours needed for good production of high quality vegetables, sophisticated pest management technology, in preference to cultural pest management practices, is imposed on relatively simple production systems. This has resulted in great wastage of pesticides with consequent problems. Pest management is even more complex in areas of intense cultivation and central planning. Provision of professional pest management services and more specialized production on larger, more highly mechanized farms have been recommended. It has been suggested too, that the electronic media be more thoroughly explored as an effective training tool, that research and training programmes be more field oriented and designed to accommodate more objectively selected target groups, and that adequate guarantees and incentives be provided for motivating more people toward total commitment to vegetable production, processing and marketing.