INFESTATION OF STORED FOOD PRODUCTS IN SRI LANKA

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NATIONAL SCIENCE COUNCIL OF SRI LANKA

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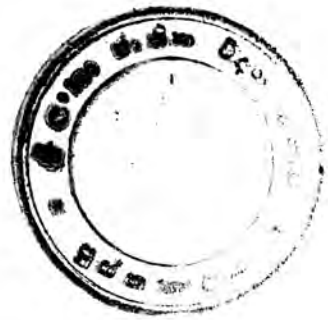
INFESTATION OF STORED FOOD PRODUCTS IN SRI LANKA

Report of the Food Panel Sub-Committe
on
Infestation and Pest Control



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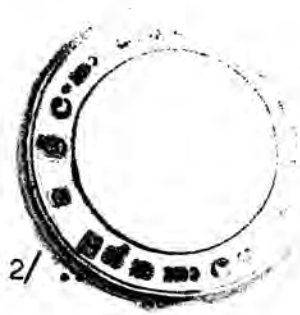
1.3 TERMS OF REFERENCE

a) To study the extent of pest infestation with particular reference to bulk storage and handling of (i) local foods, (ii) imported foods.

b) To survey the relevant information available in this field.

c) To recommend methods of control, and to offer tentative proposals for the implementations of these recommendations.



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2. ACKNOWLEDGEMENTS

The Sub-Committee records here, its appreciation for the ready assistance and co-operation extended to them, by the officers in charge of the units visited during their surveys; without which it would not have been possible to finalise this report. They wish particularly to thank the following :

1. Mr. G.E. Ratnasingham, Asst. Food Controller, Chalmers Granaries, Food Department, Colombo.
2. Mr. T.B. Packeer, Grain Surveyor, Chalmers Granaries, Food Department, Colombo.
3. Mr. P. Ramanathan, State Flour Mill, Mattakkuliya.
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They also thank the Secretarial Staff of the National Science Council for their assistance with the typing and preparation of this Report.

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3. PREAMBLE

The world-wide importance of the problem of loss of stored foods, brought about by pests, is reflected in the attention given in recent years to research into methods for the prevention and control of pests of stored products. It is estimated that on the average, 10% of the total food produced in the world is lost due to infestation during storage. Losses are reported to be higher in the tropical and sub-tropical regions of the world. Pest infestation in stored products in Sri Lanka has been brought into focus at different times, and several attempts have been made to study this problem.

Upto now, the responsibility for this aspect of stored products research has not developed on anyone authority, and no serious measures for assessing the extent of losses in food consignments due to insect infestation or for establishing controls of any sort have been undertaken on a national scale.*

In addition to an actual loss in quantity, infested foods undergo a deterioration in market quality with a lowered nutritive value.

4. PROCEDURES ADOPTED TO STUDY THE PROBLEM

Three aspects of the problem were considered :

(i) Compilation of a check - list of stored product insects recorded in Sri Lanka

It was agreed that first, relevant information on the nature and source of insect infestation in stored products

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* (i) A total loss of 3% has been estimated by the Grain Surveyor of Chalmers Granaries for these items stored at the Granaries. This estimate only covered badly deteriorated consignments which had to be totally discarded. Personal communications - Asst. Food Controller, Chalmers Granaries.

(ii) At the CWE Stores, loss in food consignments caused by insect attack alone, was estimated at Rs.4½ laks per annum - Private communications from Dr.N.N. de Silva, D.G.M. (Research)

(iii) Wright (1965) estimated the total losses during storage for all food items as being of the order of 5 per cent per annum. The total food imports for the year 1967 amounted in value to Rs.972 million(1). The loss for imported food stuffs if calculated on the basis of Wrights estimate, would amount to approximately Rs. 48.6 million.

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in Sri Lanka should be collected and complied. It was decided that a check-list of the stored grain pests recorded in Sri Lanka be prepared. This could be published and would serve as a useful reference source. To this end, a preliminary check-list of stored product insects recorded by the Entomology Division, Department of Agriculture; and the Microbiology Division of the CISIR was complied. It was found that a preliminary list of types insolated from food items handled by the CWE has also been prepared.

4.2) A Survey of the relevant information in this field

A survey of the relevant information in this field was made. This revealed that problem of storage and protective measures which could be adopted for stored foods in Sri Lanka have been dealt with exhaustively in various reports submitted to the Government of Sri Lanka. In our investigations therefore, no attempt was made to duplicate these studies, some of which are very detailed. Reference to relevant sections of these reports is made within the list of Part 6 - Recommendations of this Report.

4.3) Investigational Surveys

The main part of our action programme was to survey the present conditions existing at some of the granaries and central food stores in the country, and to consider means by which some or all the recommendations already made, could be implemented.

The Sub-Committee visited and had discussions with the Officers in Charge of the folowing food stores.

1) Chalmers Granaries
2) State Flour Mill
3) CWE Food Stores : (i) Laboratories at Vauxhall Street
   (ii) Macallum Stores
   (iii) Maligawatte Stores

No attempt was made to visit any of the G.P.S. Stores as surveys of these units have already been undertaken.(8) Moreover, the need for better storage facilities for paddy, to minimize losses in storage has already been recognized by the Government. The Draft Agricultural Development Plan for 1971-77 embodies firm proposals for the improvement of grain store sanitation; for the provision for fumigation and other treatment of store buildings; and for the provision of an Advisory and training programme in grain stores management and sanitation.(6)

5. OBSERVATIONS AND COMMENTS

5.1 Storage Facilities

By and large, most of the warehouses used by the food department and the CWE are outmoded buildings where the constructions are not provided with adequate ventilation and air circulation, nor do they allow for adequate cleaning and orderly movement of stored products. No provision for keeping pigeons, crows and rodents out, has been made. Of the warehouses and stores visited, only the State Flour Mill has been built on scientific lines to enable bulk handling of wheat in the port with facilities to minimize food deterioration. Yet, even here, due to not providing enough cleaning gangs, warehouse hygiene is at a minimal level and several storage pests were observed, both in the milling and packaging area.

The problem of infestation was most acute at the Food Department Stores at Chalmers Granaries. Practically, every known pest of stored grain had been observed in these stores. The storage space was inadequate, and the result was that food consignments were stored wherever space could be found. No corridors were left between the stacks which often reached upto the roofs. Conditions were such, that even had the unit been provided with adequate cleaning gangs, very little house keeping could have been accomplished. Cargoes infested at the country of origin and the use of second-hand bags for packaging, were a source of cross infestation.

The problem of storage was not acute at the State Flour Mill. Consignments moved relatively fast, the maximum period of storage within the Silos being 1 to 1½ months. Processed wheat was not stored for longer than 12 to 14 days.

The storage provided by the CWE stores was adequate, except during certain periods when purchasing is done at harvest time. A policy for rationalisation

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of space is adopted as far as possible. The main problem is that shipments have to be cleared within a minimum period of time, so that a deft manipulation of storage is needed within the CWE Stores complex.

5.2 Fumigation

Small fumigation units have been established and are in operation at the CWE and CG Stores. However, these are inadequately staffed and financed and completely successful prevention programmes cannot therefore be adopted or maintained. The Sub-Committee was greatly impressed by the attitudes of the officers in charge of these units. Inspite of the magnitude of the problem facing them, valiant attempts were being made to combat the causes, with the minimum trained personnel and financial provisions. All these units had identified and studies their own particular problems, and had ready many suggestions for improving their action programmes. Some of these suggestions have been incorporated in our recommendations.

5.3 Quality Control

Most of the problems in poor quality have arisen for one or some of the following reasons.

1. Bad packaging
2. Bad storage on board
3. The imported food items are not fumigated before unloading
4. Bad handling at Port
5. Insufficient store space.

Health Certificates for imported food items are not always called for. This is especially so, for the items stacked at Chalmers Granaries. Often therefore, infestation becomes apparent within 2 months of storage. Wheat imported for the State Flour Mill is fumigated and certified before despatch, and so far no infestation has been observed in any of the Silos.

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At Chalmers Granaries, goods are condemned on a report issued by the Government Analyst. No criteria are laid down on the permissible level or the minimal level of pest incidence in food items for human consumption. Infestation if noted is reported, but no special analyses for insect or rodent damage is carried out.

At the State Flour Mill's analytical laboratories, samples of all shipment are checked for a) infestation
b) moisture content
c) ash content
and d) gluten content.

The CWE maintains its own quality control laboratory at Vauxhall Street. For imported consignments, a certificate of conformity to standards is called for from the country of origin. Items are condemned as -

a) totally unfit for human consumption and are destroyed ;
or
b) as partially deteriorated. These items are not destroyed, but are sold as sub-standard products at reduced prices.

Food items purchased locally by this unit also come under quality control. Standards for all items handled by this unit have been worked out.

However, it is regretted that this programme ends at the stores. Post-production quality controls are maintained only at the purchase points and in the go-downs. No quality controls in the retail depots are maintained although the CWE flying squads has on occasion reported cases where sub-standard products of lowered nutritive value and market quality were available to the consumer.

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6. RECOMMENDATIONS

The major agencies for depredation in food resources are insect pests, moulds and rodents.

The Short-term measures we have recommended would prevent substantial losses (accruing) from insect infestation. Mould control can be achieved by storage under controlled humidity, moisture being the most critical factor for mould growth.

We have not dealt with rodent control measures in great detail. However, this aspect of infestation has also been taken into account in the long-term recommendations we propose.

In our proposals, we have also outlined a programme for the development of R & D Unit in this field. A scientific approach should be made to every stage of food conservation, production, handling, transport (distribution), processing and storage; and no country with a storage problem as massive as ours, can afford to neglect this very important aspect. We stress here that our problem of reducing pest damage, in commodities purchased to feed the nation, is not insurmountable and can be achieved with some effort and at comparatively little extra cost.

6.1 PART A - Short-Term Recommendations

The following short-term measures are recommended.

6.1 (a) Storage and Stacking Practice

Improved storage practice will contribute largely in increasing marketable commodities, both quantity wise and more important quality wise. Some prelininary measures which may be put into immediate effect are listed below.

(i) Store-space

Procedures for rationalizing available store-space could be adopted. Stores which have good circulation and where fumigation and proper stacking can be carried out, could be secured for the storage of slow-moving items or reserve stocks, while other

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stores could be maintained for those commodities that are stored for short periods. Prolonged storage should however be avoided wherever possible.

Separate stores should be provided from the handling of high quality products (such as CARE supplies). Under the conditions prevailing at Chalmers Granaries, there is a high incidence of cross-infestation from other products.

(ii) Stacking

Stacks should be as large as possible to reduce to a minimum the surface exposed to infestation. Provision of dunnage should never be neglected. Inspection corridors 2 ft. wide should be left around the walls of all commodity stores and adequate space should be left under the rafters so that control measures can be applied when necessary.

(iii) Packaging

The problem of cross-infestation can be reduced to a great extent by the pre-treatment of second-hand sacks and bags before re-use. A method for the insect-proofing of gunny bags has been perfected by the CFTRI, Mysore.(4)

This method could be adopted here with ease. A portable spraying machine which is simple to operate has been developed. The formulation for use with this machine has also been prepared. Pre-treatment can be undertaken by a central organization vested with the responsibility for collection and pre-treatment of all sacks and bags and for their pre-treatment prior to release to grain bagging centres.

It is held that this treatment is effective for periods of 3 to 5 years, and that this pre-treatment gives a significant increase in use-life of the bag.

6.1 (b) Sanitation and Housekeeping

Systematic routine cleaning of premises should be carried out at all food stores. Routine housekeeping measures should attempt a thorough cleaning and limewashing of all empty stores. Routine sweeping and where possible, vacuum cleaning should be practised during storage.

All transit stores should be emptied at least twice a year to allow for the cleaning of rafters, ledges, cracks in walls and floors which harbour insects.

Cleaning gangs would have to be employed on a fulltime basis to undertake this house - keeping programme. All refuse should be incinerated.

6.1 (c) Improvement of Storage Structure

Storage structure can be improved by introducing simple modifications (at little cost) to make them rat-proof. Mesh covering over the tops of warehouses could adequately prevent the entry of pigeons and crows.

6.1 (d) Quality Control

(i) Local Food Commodities

All local food commodities should be subjected to post-harvest disinfestation. (1)

(ii) Imported Food Commodities

All incoming food commodities should be checked for incidence of pest damage and subjected to fumigation prior to stacking. (2)

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(1) Rice : Since the incidence of insect infestation is very much higher in raw rice than in parboiled, it would be advantageous to replace raw rice (local imported) with parboiled rice wherever possible.

(2) The feasibility of fumigating all infested rice shipments in ship holds, by the Port Health Office staff, before discharging was discussed at the Ministry of Agriculture, as a result of a consignment of 44,000 tons of imported Burmese raw rice being found to be badly infested at the warehouses. It was suggested that a Grain Storage Officer inspect every shipment of food commodity arriving in the country. The Port Health Officer could then be advised of the control measures required.

Rice shipments in the ships hold are fumigated by the Port Health Authority as an anti-plague measure. This procedure could well be extended for insect pest disinfestation as well.

(Unpublished Report to Food Commissioner, from Grain Storage Officer, 1971.)

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Standards

Standards for the maximum allowable level of specific pest incidence should be drawn up.

a) All food consignments should be sampled and assessed as (i) Short-storage items
(ii) Long-storage items

All damaged consignments should be subjected to a rigorous assessment of acceptability of fitness for human consumption. Damaged or infested commodities should be assessed as :

a) Disposal items - these to be further classified as (a_1) Sub-standard products fit for human consumption,
(a_2) Sub-standard products unfit for human consumption, fit for animal food.

b) Items to be totally destroyed, (or diverted for non-food use.)

In this last category should be included any commodity found infested with Trogoderma granarium. Commodities found infested with this species are totally condemned on World Standards, They are then destroyed or used for the manufacture of starch paste etc.

Food items condemned as unfit for human consumption should be disposed of within the minimum possible time.

Certain commodities which are exported from Sri Lanka will not be accepted by the importer, unless accompanied by a certificate that the commodity is free of the following insect pests :

1. Trogoderma granarium Everts (Khapra beetle)
2. Caulophilus latinasus Say
3. Pyroderces rileyi Wals
4. Necrobia rufipes DG (Reg legged Ham beetle)
5. Callosobruchus quadrinaculatus Fabr (Cowpea beetle)
6. Callosobruchus chinensis Fabr
7. Lasioderma sorricorne Fabr (Cigarett beetle)

Similar certificates should be called for from the country of origin of food items imported to the island, wherever practicable.

6.2 PART B - Long - Term Recommendations

6.2 (a) Storage and warehouse hygiene

Warehouse hygiene is of utmost importance for the maintenance of quality in stored products. Standards must be formulated for storage and handling of food stuffs. These standards would apply to building of warehouse, maintenance of buildings and an organized pattern of storage, and packaging.

The standard practices to ensure good storage cannot be carried out at many stores that are being used today. None of these buildings are suitable for grain storage. New stores should be planned to replace these. They should be constructed on lines which facilitate the orderly movement of stored products with at least one entry and one exit point. At present, in the warehouses at Chalmers Granaries, items that are stacked first issued last. The floors should be of concrete and should also be water and vapour proof; the building not only weathertight, but provided with devices to keep insects, birds, rodents, etc. out.

6.2 (b) Quality Control Regulations

There are no effective regulatory activities to protect food from deterioration as it moves through marketing channels from farmer to consumer, and to assure consumers of wholesome food. The 1965 Wright report made certain recommendations on the organizational aspect of such a unit - 'The Product Inspection and Control Unit' - and outlined the responsibilities that would devolve on them. At this moment, there is a small viable quality control unit in the CWE. However, their responsibilities end when their stocks are sold to the Co-operative and retailers. It is the lack of

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quality control at the latter points that lead to the sale of Sub-standard products to a large number of consumers. Regulations must not only be drafted, but enforced to make it compulsory for all food items (except canned foods) that are imported to be fumigated before storage. Either at point of shipment, aboard the vessels or on lighters or at the point of entry. At the moment, we are unable to request the first two demands or carry out the third.

Already, rodent control in grain infested areas is carried out by Hydrogen cyanide (HCN). However, this fumigant does not penetrate well and the dosage used is not adequate for insect pest control. If Methyl bromide (CH_3Br) in adequate levels is used for fumigation of stored food products, insects too could be effectively controlled together with the rodents. In time, the regulatory activities should also extend to include the following :

1. Inspection of raw commodities, meat, eggs, fruits, vegetables, fish and other sea foods.
2. Inspection of food handling establishments which process, store and distribute foods, and of eating and drinking establishments.
3. Inspection for food additives, pesticides residues and animal food medications.

6.2 (c) Research and Development

Satisfactory infestation control cannot be introduced as an established technical routine, unless preceded by research projects of a high scientific order. It is also necessary that a careful study of local conditions and crops, means of transportation, cost of labour be made. Methods of control satisfactory on one locality could well fail to be an economic control method under different conditions. To this end therefore,

it would be necessary to establish an infestation control Research & Experimental Development laboratory either as an independent unit or as an extension of one or other of the existing units in the country.

Some projects which could be undertaken by the Unit are listed below :

(i) A study of traditional storage facilities, with the aim of determing low-cost structures particularly suitable for storage of small consignments. Storage practices under controlled humidity conditions could be investigated.

(ii) Methods and techniques for the application of small-scale disinfestation prodedures which could be applied at various stages of bulk handling, transport and storage of food commodities.

(iii) Studies on pesticidal compositions for the conservation of food grain under tropical conditions.

(iv) The use of solar heat for maintaining controlled temperatures in storage units.

(v) Basic studies on life-cycles of pests of stored products, under tropical conditions, and inactivation by heat.

(vi) Use of the newer funigants and establishment of effective minimum dosages.

(vii) Pesticide residues in foods.

(viii) Processing of food grains to induce resistance to insect attack.

It is recommended that the National Science Council explore seriously the possibility of the early establishment of such a R & D Unit.

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7. CONCLUSION

At present, the methods employed for the prevention and control of insect infestation in the major food stores are ad-hoc ones, and depend to a large extent on the enthusiasan of the officers in charge of the Units.

No one Unit or organization in Sri Lanka is responsible for infestation and pest control. A single controlling authority must be established, if any recommendations are to be effectively inplemented.

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APPENDICES

APPENDIX I

Part A - Chalmers Granaries

The Sub-Committee which visited these warehouses on the 31st August 1972 was met by Mr.C.G. Ratnasinghan, Asst. Food Controller. Valuable discussions were held with Mr. Ratnasinghan and with Mr. T.B. Packeer, Grain Surveyor, who also conducted the Sub-Committee on its investigational survey. Our findings are submitted herewith.

I. Food Stuffs handled and Countries of Origin

These granaries are the major stores of :

a) Rice - (i) Country, (ii)imported from China, Burma, Pakistan and Thailand.

b) Flour- (i) imported direct from Australia, USA, Canada, Italy and the Continent (Belgium, Holland, France and W.Germany)
(ii) processed by State Flour Milling Corporation

c) Lentils - split and whole - country of origin; Middle East, Ethiopia, Syria and India and Turkey.

II. Storage and Stacking

Food consignments were stored in these granaries for periods ranging from 2 to 9 months and sometime even longer. Storage space was inadequate for which reason, mixed stacking was the normal practice. Some attempt however, was being made to store long-term consignments in special stores.

Large structures housed, consignments such as CARE milk powder, lentils and wheat flour, together.

Stacking reached as high as the roofs in many of the warehouses and "corridor" space, between stacks were altogether lacking or inadequate. Officers-in-charge were very aware that no standard stacking practices were being followed, but the demmurage involved was too high to warrant consignments being held in the port warehouses, till such time as adequate space was found for consignments in the Granaries. Deterioration in all items was consequently very high.

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III Infestation

Practically all known pests of stored grain have been observed in these granaries.

Imported Rice - Infestation was observed to start, in most of these consignments about two weeks after landing, indicating that infestation began at the country of origin. It was reported that in 1970, a consignment of 40,000 tons of rice from Burma infested with Corcyra sp. had to be totally discarded. In July 1972, two samples from badly deteriorated consignments sent to the Govt. Analyst for report showed evidence of insect attack to the extent of 80 and 30 per cent respectively. Recent consignments of Rice from China, have been observed to be badly infested with mites.

Country Rice - These consignments are stored for a maximum period of 1 to 2 months. It was observed that 90% of the infestation occured through the use of second hand bags for packaging. These bags are not subjected to even a preliminary cleaning. 3,000 bags used by the unit in Jan/Aug this year showed no external evidence of insect damage. A closer examination had however revealed insect webbing and debris on the inside. As field infestation for country rice was negligible, these bags were probably the original source of weevil infestation in country rice. Cross infestation also occurs at the collecting and storage points and during transport.

Rice sweepings - These are received by rail from all parts of the country. Infested grain sweeping are shifted, cleaned and repacked.

Flour - is stored in these warehouses for periods of 7 to 8 months. These consignments were observed to be badly infested. Infested flours abound with weevil adults and larvae. Infested flours had lower gluten content and a higher uric acid present. This latter feature lowered the organoleptic acceptability of the product to the consumer.

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Lentils - were stored for considerable lengths of time as these stores normally carry a 2 month excess of stock to meet any emergency requirement. All consignments were observed to be badly infested. It is possible that infestation begins at the country of origin - especially for those consignments arriving from the Middle East, which were observed to be badly infested. Very little infestation was observed in the consignments from India. Split peas could be stored for longer periods than the unsplit varities.

IV Preventive and Control Measures Adopted

(1) Health Certificates from country of origin. No Health certificates were called for or received with any commodity.

(2) Deteriorated consignments were surveyed by Loyds Shipping Insurance, if they were observed to be badly water logged, this was estinated at not more than 1 %.

Pest infestation Surveys were not carried out for any commodity. Badly deteriorated consignments were condemned on a report issued by the Govt. Analyst. These certificates however, merely report on fitness for human consumption. No specific criteria are laid down for the minimal level of pest incidence for the products and although infestation if noted, is reported, no routine analysis for insect or rodent damage is carried out.

(3) Fumigation A small fumigation unit has been set up and began functioning in March this year (1972). This unit is presently staffed with a team of 5 and although the team works regularly, each store can only be fumigated once in four months. No training programmes have been organized for the staff, nor has there been any increase in the cadre.

(4) Housekeeping No programme for housekeeping is possible under the present conditions.

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V. Observations

The difficulties of maintaining even the minimum standards of hygiene and housekeeping were very apparent. Inadequate storage space, mixed stacking and the use of unclean second hand bags for packing contributed to the occurence of cross infestation with subsequent deterioration in the commodity.

Wagons used for the transport of commodities housed within the premises were another major source of infestation. These wagons were never subjected to any prior cleaning. The total loss due to insect and rodent damage has not been fully assessed, although a conservative estimate of 3% has been given as the figure for the granaries.

Many deteriorated and infested sub-standard products were subjected to a preliminary cleaning before despatch to the retailers.

VI Recommendations

The present highly unsatisfactory conditions existing in the store could be remedied, if some of the recommended control measures are put into force.

(1) Every consignment should be fumigated, at the country of origin, before despatch, and a certificate should accompany each consignment. This system operates for commodities received by the C.W.E. 75% per cent of the infestation now can be arrested by these means.

(2) Stores space should be increased. A minimum of 500 sq. ft. of floor space for every ton of food, i.e. 15 bags high is required.

(3) Fumigation - Present staffis woefully inadequate, though 3 units are in operation. Minimum requirement of 10 units is necessary to provide an adequate control programme.

Each unit should consist of : 1 Trained officer
1 Foreman
1 Labourers

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The basic qualifications for officers to be recruited should be G.C.E. 'A' level with Chemistry/Biology. These officers could be sent for further training to one of the following centres :

(a) CFTRI, Mysore

(b) Grain Store Centre.

A minimum period of 3 months training will be required. Fumigants and protective clothing which are now in short supply, should be provided in adequate quantities, if these control measures are to be effective.

Part B - State Flour Mill

At the State Flour Mill, the Committee met and had valuable discussions with Mr. P.Ramanathan who also conducted the group through the Mill and Storehouses.

I. Observations

The infestation problem in the State Flour Mill is relatively less in comparison to that encountered at the other sites inspected.

The consignments received upto now, originate from Australia. Wheat is fumigated before despatch and each consignment is issued with a health certificate. The moisture content is kept very low. So far, no infestation has been observed in the Silos. However, the possibility of infestation within these Silos has been envisaged, and in their constructions provision has been made to allow for fumigation which allow in 4 of the 8 Silos. Silos are maintained at 32°F. These chambers which allow for fumigation under pressure have unfortunately sprung leaks, which we understand, cannot be corrected unless a major construction repair is undertaken.

Wheat once processed, is not kept in storage for periods longer than 12 to 14 days.

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1.1 Quality Control - A quality control unit has been set up within the complex, and shipments are sampled and checked here for

a) infestation
b) moisture
c) ash content
d) gluten content

Infestation - The only pests recorded so far are : Sitophilus oryzae and Trogoderma granarium.

Damaged bags, particularly have been found with T.granarium. Rodents were a major problem at these mills.

1.2 Packaging - New bags from Pakistan are presently being used for packaging the processed wheat. However, for periods of 6 to 7 months of the year, second hand bags are used. These are only given a preliminary cleaning using blowers before reuse. These bags were fumigated at the Port Fumigation Centre sometime ago. The Port Fumigation Centre now needs a major repair and does not undertake the cleaning of second hand bags. Bags used for transport of Bran are not fumigated, nor even subjected to a preliminary cleaning before re-use.
Cross infestation obviously occurs through the use of these second hand bags.

Retail Packaging

Retail packaging in polythene bags is undertaken in a section of the building. Our observations were that although the flour did not appear to be infested, cross infestation could occur from the surrounds.

Control Measures

Housekeeping was inadequate, and in unused machinery, along the edges of walls and sills and crevices on the floor, weevil larvae and adult abound. These would be a very likely source of infestation; especially in retail packages.

A thorough cleaning of the entire building has been undertaken and machinery not in use is cleaned, and treated with a commercial insecticide with little residual effect. However, the inadequacy of staff for maintenance and housekeeping prevents this programme being fully effective.

No rodent control programme is in force and rodents too therefore present a major problem in these stores.

II Recommendations

A good sanitation programme would adequately reduce the insect-infestation problem. However, the problem of rodent infestation is also very acute at the Mill, for which controls are in force.

It is recommended that :

1) that a fumigation and pest control unit be set up, with personnel specially trained for fumigation.
2) Housekeeping should be improved. A gang of 10 persons working full-time is considered adequate for the regular maintenance of the building and surroundings.
3) Fumigation of the total mill should be undertaken and completed once a year.
4) A study of the rodent problem should be undertaken immediately.

Part C - C.W.E. Research & Development Division

The Sub-Committee visited the laboratories and some of the stores of the C.W.E. At the laboratories, Dr. N.N. de Silva, Deputy General Manager (Research and Development) met and had discussions with the group.

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Organization

This complex has four main groups of stores.

1) Welisara)
MacCullum Road) These stores are issue stores. Dried fish and other fast moving provisions are stored here.

2) Maligawatte)
Rajagiriya) These are reserve stores.

3) San Sebastian, Hultsdorf)
Denatagoda) For storage of special commodities.

4) Paradise Road Stores) Here sub-standard goods are stored, sifted and cleaned before despatch.

II. Storage and Stacking

By and large, the storage space provided for this complex is adequate, except at certain periods, when purchasing is done at harvest time, and space has to be allotted for large reserve stocks of cereals.

Some stores are reserved for fast moving items, e.g. issue stores at Welisera and MacCallum Road; while certain stores function as reserve stores - Maligawatte and Welisera. Here items are held for longer periods. Chillies are stored at the San Sebastian Stores, dates at Denatagoda; while sub-standards commodities are despatched to the Paradise Road Stores, where they are held till inspected and condemned as totally or partially unfit for human consumption. Items classified as partially unfit for human consumption are subjected to a shifting and cleaning and sold at reduced rates, as sub-standard items.

Stacking

Standard stacking practices were followed. Stack sizes of 30' x 20' were maintained to allow for fumigation.

III. Infestation

A survey of insect infestation in commodities stoed in this complex was undertaken at the laboratories at Vauxhall Street, under the direction of Dr.N.N. de Silva, D.G.M. (R & D). An analysis of types observed and recorded, has revealed that some of those species doe not breed locally indicating that infestation had begun at the country of origin.

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The survey is continuing, and research workers at the C.W.E. Laboratories in Vauxhall Street are presently studying the behaviour of insects in relation to light and heat.*

A check list of the insects observed has also been prepared (see Appendix II - Part D) in these laboratories.

IV. Preventive and Control Measures Adopted

A fumigation unit was started early this year to combat the problem of infestation in food commodities handled by this complex. This was found to be an urgent requirement, as no response to requests for assistance could be obtained from the Agriculture Department, the Food Control Department or the private sector.

This unit headed by Mr. Jayantha Fernando, is assisted by four Quality Control Officers. These officers inspect the stacks, and report back to the Laboratory, where stacks are observed to be infested.

The present fumigant used is phostoxin. As this is expensive, the unit proposes to try "Durofume" - a wide spectrum fumigant prepared and recommended by the C.F.T.R.I., Mysore.

The methods for fumigation now employed as purely empirical, and it has not yet been possible to test the effectiveness of the programme. Further research in this area is badly needed.

V. Quality Control

Standards for all food items handled by this complex have been worked out in the Laboratories at Vauxhall Street.

However, the division only undertakes post-productive Quality Control.

Samples of items to be purchased are examined in the laboratory, and purchases decided on, only if these items conform to the standards laid down by the Division's Quality Control Unit.

In the "go-downs" quality checks are done by the Quality Control Officers, who report back on the conditions of the commodity, and recommend fumigation, if necessary.

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* DE SILVA, N.N. (1972) The C.W.E. Research and Development Division. A report to the Board. Colombo.

However, this programme ends at the Stores, although the C.W.E. Flying Squad has on occasions reported when sub-standard goods are held in any of the retail stores.

VI. Observations and Recommendations

The Sub-Committee were greatly impressed by the work being done at the Laboratories. However, further improvements are possible, and the following porposals are recommended.

(1) Fumigation Unit

At present, a small team works on fumigation. It is recommended that a fumigation unit be set up, comprising of :

(a) 4 Fumigation Officers, with minimum qualification B.Sc. General with Chemistry and Zoology as these officers will be required to undertake a certain measure of responsibility.

Training

Further training in techniques of fumigation will be required and these officers could be trained at the C.F.T.R.I. Mysore, which has a well established Infestation Laboratory. No problem for obtaining equipment was envisaged.

(2) Quality Control

At present the consumer has to rely on the Govt. Analyst, and any local authority that may be interested in the problem to maintain quality control in food items marketed by the C.W.E.

It is suggested that procedures be laid down to extend quality control to the trade.

A central authority, for maintenance of pest control and quality control should be established, either independently or through the expansion of the Unit, like that already in existence at the C.W.E. Research and Development Division.

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APPENDIX II

CHECK-LIST OF STORED PRODUCTS INSECTS RECORDED IN SRI LANKA

Part I - Species identified in infested food items sent to Central Agricultural Research Institute, Entonology Division and Ceylon Institute of Scientific and Industrial Research, Microbiology Division.

I. Cured seeds - Cereals and legumes

Paddy	Sitotroga cerealella
Rice - raw	Sitophilus oryza Rhizopertha dominica
... ...	Corcyra cephalonica Oryzaephilus surinamensis
... ...	nites
Rice - parboiled ...	Sitophilus oryza Rhizopertha dominica
... ...	nitos
Maize	Rhizopertha dominica
... ...	Sitophilus cerealella
... ...	Sitophilus oryza
Barley	Sitophilus oryza
Beans	Bruchus sp.
Peas, Gram, Dhal	Sitophilus granarius
	Lasioderma serricorne

II. Processed cereals and Products high in carbohydrates

Cornflour	Oryzaephilus surinamensis
... ...	Tribolium castaneum
... ...	Lasioderma serricorne
Wheatflour, Rulang	Tribolium castaneum Cadelle (Tenebroides mauritanius)
Atta Flour	Oryzaephilus surinamensis
Whole wheat flour ...	Tribolium sp.
Kurakkan flour ...	Tribolium sp.
Biscuits and Breakfast cereals..	Tribolium sp.
	Oryzaephilus surinamensis
Sago (tapioca) ...	Sitophilus sp.

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III. Spices - Raw and processed

Corinander (raw)	..	Lasioderma serricorne
Fennel	..	Stogebium paniceum
Cummin seeds	..	nites
Chillie pods ..	..	nites
Curry powder (processed)	..	Trogoderma sp. (not T. granarium)

IV. Pests of Animal products

Dry and Maldive fish	..	Trogoderma sp. (not T. granarium)

V. Other food commodities

Cocoa - beans ..	..	Oryzaephilus surinamensis
Tobacco	..	Lasioderma serricorne/ Tribolium castaneum
Sago (tapioca)	..	Sitophilus sp.
Potatoe	..	Gnorimoschema opercula
Raisins	..	Oryzaephilus surinamensis
Dates	..	Oryzaephilus surinamensis

Part II - List of Insects observed in food commodities in Sri Lanka, complied from F.N. Wright's Report

Paddy

Rhizopertha dominica
Sitophilus oryza
Oryzaephilus surinamensis
Sitotroga cerealella
Xylocoris flaripes
Alphitobius diaperinus
Tenebroides mauritanicus
Psocids
Trogoderma granarium

(Xylocoris flaripes, Alphitobius diaperinus, Tenebroides mauritanicus: Presence of these species indicative of damp conditions.)

Raw Rice Bran

Tribolium castaneum
Rhizopertha dominica
Alphitobius diaperitus

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Rice Sweeping

Alphitobius diaperinus
Tenebroides mauritanicus
Sitophilus oryza
Rhizopertha dominica
Palorus ratzburgi
Lasioderma serricorne
Parlorus ficicoda
Cryptolestes pusillus
Latheticus oryza
Cryptolestes ferrugineus
Tribolium castaneum
nites
psodids

Copra

Necrobia
Carpophilus mutilatus
Carpophilus piloselius

Poonac

Necrobia rufipes
Carpophilus dimidiatus
Ahasverus advena
Lasioderma serficorne
Tribolium castaneum
Oryzaephilus mercator
Desmestes frischii(larvae)

Cocoa

Araecerus fasciculatus
Carpophilus dimidiatus
Cryptolestes pusillus
Psocids

Tea

Trogoderma granarium

Tobacco

Lasioderma serricorne
Tribolium castaneum

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Part III - Types of Insects that were found to attack different food items handled by the CWE*

Barley

1.	Sitophilus granarius	(RHYNCHOPHORA)
2.	Tribolium confusum Tribolium castaneum Parlorus	(TENEBRIONIDAE)
3.	Acanthoscelides obtectus	(MYIABRIDAE)
4.	Oryzaephilus surinamensis	(CUCUJIDAE)
5.	Lasioderma serricorne	(ANOBIIDAE)
6.	Mite	
7.	Rhizopertha dominica ..	(BOSTRICHIDAE)
8.	Honoptera	(CICADELLIDE)
9.	Aphid	(APHIDIDAE)

Coriander

1.	Lasioderma serricorne .. Stegobium paniceum ..	(ANOBIIDAE)
2.	Psocid	
3.	Tribolium castaneum ..	(TENEBRIONIDAE)
4.	Pseudoscorpion ..	
5.	Oryzaephilus surinamensis Cathartus advana	(CUCUJIDAE)
6.	Acanthoscelides obtectus	(MYIABRIDAE)

Mysoor Dhal

1.	Tribolium confusum Tribolium castaneum Parlorus ratzeburgi	(TENEBRIONIDAE)
2.	Psocid	
3.	Sitophilus granarius ..	(RHYNCHOPHORA)
4.	Acanthoscelides obtectus ..	(MYIIBRIDAE)
5.	Laemophloeus pusillus ..	(CUCUJIDAE)
6.	Spider	(ARACHNIDAE)
7.	Scolytidae	

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* Extract from a Report of the CWE Research and Development Division to the Board of Directors, CWE; prepared by Dr. N.N. de Silva, Deputy General Manager (Research and Development Division).

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Dates

1. Oryzaephilus surinamensis, Laenophloeus pusillus (CUCUJIDAE)
2. Mites
3. Pharaaxonothakirschi .. (EROTYLIDAE)

Chillies

1. Psocid
2. Spider .. .. .. (ARACHNIDAE)
3. Tribolium castaneum, Tribolium confusum .. (TENEBRIONIDAE)
4. Lasioderma sericorne .. (ANOBIIDAE)
5. Oryzaephilus surinamensis (CUCUJIDAE)
6. Sitophilus granarius .. (RHYNCHOPHORA)

Green Gram

1. Laenophloeus pusillus .. (CUCUJIDAE)
2. Psocid
3. Scolytidae .. (BIASTOPAGA)
4. Tribolium confusum .. (TENEBRIONIDAE)
5. Trogoderma inclusum .. (DERMASTIDAE)
6. Sitophilus granarius .. (RHYNCHOPHORA)
7. Acanthoscelides obtectus (MYLABRIDAE)

Maldive Fish

1. Necrobia rufipes .. (CLERIDAE)
2. Mites
3. Tenebroides mauritanicus (OSTOMIDAE)
4. Dermestes lardarius .. (DERMESTIDAE)
5. Spider .. .. .. (ARACHNIDAE)

Gram Dhal

1. Sitophilus granarius .. (RHYNCHOPHORA)
2. Tribolium confusum .. (TENEBRIONIDAE)
3. Rhizopertha dominica .. (BOSTRICHIDAE)
4. Oryzaephilus surinamensis (CUCUJIDAE)
5. Lasioderma serricorne .. (ANOBIIDAE)
6. Acanthoscelides obtectus (MYLABRIDAE)

Green Moong

1. Sitophilus granarius .. (RHYNCHOPHORA)
2. Oryzaephilus surinamensis (CUCUJIDAE)
3. Lasioderma serricorne .. (ANOBIIDAE)
4. Tribolium castaneum, Tribolium confusum (TENEBRIODIDAE)

5. Cicadellidae .. (HOMOPTERA)
6. Psocid

Cumnin Seeds

1. Stegobium paniceum) (ANOBIIDAE)
   Lasioderma serricorne)
2. Tribolium confusum)
   Tribolium castaneum) (TENEBRIONIDAE)
   Palorus ratzeburgi)
3. Tenebroides mauritanicus (OSTOMIDAE)
4. Cathartus advens) (CUCUJIDAE)
   Laenophloeus pusillus)
5. Necrobia rufipes (CIERIDAE)
6. Mites
7. Acanthoscelides obtectus (HYIABRIDAE)

Garlic

1. Tenebroides mauritanious (OSTOMIDAE)
2. Laenophloeus pusillus) (CUCUJIDAE)
   Dryzaephilus surinamensis)
3. Tribolium castaneum) (TENEBRIONIDAE)
   Alphitobium)
4. Lasioderma serricorne .. (ANOBIIDAE)
5. Carpophilus hemipterus .. (NITIDULDIE)

Flour

1. Tribolium confusum)
2. Tribolium castaneum) (TENEBRIONIDAE)
3. Alphitobium diaperinus)
2. Aphid .. .. .. (APHIDIDAE)
3. Lasioderma serricorne.. (ANOBIIDAE)
4. Rhizopertha dominica .. (BOSTRICHIDAE)

Sago

1. Lasioderma serricorne.. (ANOBIIDAE)
2. Lenophloeus pusillus .. (CUCUJIDAE)
3. Rhixopertha dominica .. (BOSTRICHIDAE)
4. Carpophilus hemipterus (NITIDULIDAE)
5. Tribolium castaneum .. (TENEBRIONIDAE)

Coorid Whole

1. Alphitobium diaperinus (TENEBRIONIDAE)
2. Tenebroides mauritanicus (OSTOMIAE)
3. Acanthoscelides obtectus (HYIABRIDAE)
4. Stephanoderes hanpei (BLASTOPHAGA)