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ACTIVITIES OF THE CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE, MYSORE, INDIA[1/]

by

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I. THE AIMS AND ACTIVITIES OF THE ORGANIZATION AND ITS ROLE IN DEVELOPING TECHNOLOGIES APPLICABLE TO THE DEVELOPING COUNTRIES

Food serves the basic object of providing nutrition for the human population. The essential nutrients are generally derived from plant or animal sources and are classified on the nutritional scale as carbohydrates, fats, proteins, vitamins and minerals. The empirical experience of Indian population shows a satisfactory pattern of food consumption, but current trend towards fast urbanisation due to industrialisation and economic development has brought in certain aberrations in the dietary pattern of certain classes of consumers. Therefore, it was considered necessary to initiate research and development in the area of Food Science and Technology to ensure that nutritious food is supplied to the consumers and the loss of nutrients that may take place if the food is not handled properly after harvest is eliminated. Research and development problems in the field of Food Science and Technology in the developing countries have to be viewed from the angle of demand created by the growing population and also its distribution into distinct rural and urban centres. The problem of providing food to the urban centres is more acute because of lack of well developed channels of distribution resulting in malnutrition and higher disease incidence. The food probelm in the developing countries is not only quantitative but also qualitative. Proper conservation and utilisation of both staple and protective foods will provide the necessary answer for the uplift of the nutritional standards and

thereby better productivity, mental capacity and physical improvement of the people so as to achieve better economic development. Studies have shown not only the gap in the availability of adequate food in quantity and quality but also the inadequacies of consumption by a larger section of population due to economic constraints. The gap between availability and actual consumption gives a picture which represents the technological inadequacies to bring about the effective utilisation of available resources to meet the nutritional requirement of the population. It is this consideration which motivated the Government of India to promote research and development in the field of Food Science and Technology.

The nucleus for the Central Food Technological Research Institute was started in 1949 as an institution under the Council of Scientific & Industrial Research in pursuance of the decision of Governing Body of CSIR in 1948 with a view to play its role in the post-harvest technology which in the context of the country's need required to concentrate its efforts on conservation and preservation of raw materials to prevent losses, produce nutritionally balanced food products and incorporate convenience in the processed food products with adequate acceptability and nutritional balance for the good of the consumer. This envisages improvements in food handling, transportation, storage, processing, packaging, distribution and other complexities of food marketing system.

Objectives

1. Development of improved methods of storage for different raw materials and to prevent microbiological and chemical changes attendant on various types of spoilage, reclamation and utilisation of heavily infested or otherwise affected food materials.

2. Development of better conservation and preservation techniques so as to save food material from deterioration due to intrinsic and extrinsic factors.

3. Processing of foodstuffs with a view to improve their keeping quality and facilitate ready and convenient usage.

4. Development of relevant technology of refrigeration, freezing, gas storage, dehydration, canning, bottling, sun-drying, etc.

5. Development of design of food processing machinery and fabrication of prototypes for assessment.

6. Development of packaging design, materials, relevant machinery and equipment.

7. Development of fermented and nutritious food formulations for the vulnerable sections of population, utilisation of food industry's waste for the manufacture of more remunerative products with a view to improve the economy of the industry and also make the byproducts purposeful.

8. Development of products - a) to minimise dependence on imports, b) to promote export of products to other countries.

9. Rendering of different coarse food materials to improve palatability, digestibility and acceptability, and elimination of unpalatable constituents.

10. Development of dietetics, design and demonstration of methodology for the promotion of improved food formulations to suit the economic conditions and the taste preferences.

11. Studies on cooking utensils, improved cooking methodology with a view to saving labour and minimising the consumption of fuel.

12. Study of problems relating to industrial operations, methods of dissemination of technological information to the industry, conduct of surveys of the existing industries, their technological problems and collection of factual data for the promotion of new industries.

13. Testing and assessing of the technologies at various levels of operation.

14. Development of food information and dissemination system so as to offer service to the farmers, consumers in general and the food industrialists to overcome their problems.

Activities:

The Central Food Technological Research Institute has now grown into a premier Research and Development institution in the country. Its work is distributed in 18 major areas in the main laboratories complex at Mysore and 7 field stations dispersed over different parts of the country. At Mysore, the areas of activity are:-

1. Food Biochemistry
2. Applied Nutrition & Dietetics
3. Infestation Control, Pesticides, Storage Structures
4. Microbiology, Fermentation & Sanitation
5. Protein Technology
6. Rice & Pulse Technology
7. Wheat & Millet Milling & Baking Technology
8. Fruit & Vegetable Technology
9. Meat, Fish & Poultry Technology
10. Packaging Technology
11. Lipid Technology
12. Fermentation Technology
13. Plantation Products & Flavour Technology
14. Process & Design Development

15. Engineering and Prototype Development
16. Transfer of Technology & Consultancy Services
17. Scientific Information Retrieval and Dissemination Services
18. Training Programme -

    a) Two-year residential course leading to Master's degree in Food Technology of Mysore University

    b) Residential course leading to Master's degree in Food Science of Mysore University

    c) Residential course leading to Ph.D degree of Mysore University

    d) Short-term Refresher Courses in the areas of -
        Fruit & Vegetable Technology,
        Infestation Control in Raw and Processed Foods,
        Quality Control of Meat Products,
        Quality Control in Food Processing Industries,
        Flour Milling & Baking Technology,
        Packaging Technology,
        Cold Storage of Perishable Produce,
        Fish Processing,
        Protein Foods, and
        Food Microbiology

The activities of various field stations are:-

(a) Ludhiana: Temperate fruits and vegetables;

(b) Lucknow: Development and standardisation of traditional products and advisory service to the food industries;

(c) Nagpur: Processing of oranges, chillies, and vegetables;

(d) Bombay: Advisory service to industry and quality control surveillance;

(e) Hyderabad: Fruits and vegetables of the region, Rice Milling, etc.

(f) Mangalore: Marine raw material handling and product development;

(g) Trivandrum: Spices and other plantation crops.

Role in developing relevant technologies:

The institution renders the following services to the industry:

1) Consultancy:
   a) Preparation of model schemes, project and feasibility reports, techno-economic surveys and pre-investment studies;
   b) Design engineering service and assistance in the selection of machinery, erection, commissioning and initial operation of plants;
   c) Assistance and advice to solve problems of trouble-shooting nature;
   d) Preparation of products for market studies and consumer evaluation;
   e) Pilot plant and semi-commercial production to establish the technical and economic feasibility of laboratory process/product prior to commercial manufacture;
   f) Technical advice with regard to factory lay-out, raw material purchase, product improvement, quality control system, packaging of products and demand potentials.

The CFTRI has, on an average, provided 1604 paid consultancies during the 5-year period. In order to facilitate smooth technology transfer to the industry, the Institute offers technology as a package deal with guarantees of performance. Sponsored projects are undertaken for the development of new products, improvement of existing products and processes, utilisation of specific raw materials, development of process parameters, product assessment and by-product utilisation. Facilities are provided for standardisation, quality control and testing of products. The institution assists Government and other national agencies in the formulation of policies with regard to handling, storage and transportation of foodgrains and other perishable commodities. It offers assistance in the development of national quality control and regulatory standards for various food products.

2) Technical Information Service:

The Institute provides information and clarification on technical matters regularly. On an average, 3,500 to 4,000 enquiries from the industry, prospective entrepreneurs and Government departments are handled annually.

3) Dissemination of Information:

The Institute has a well-developed scientific information retrieval system to provide the industry and the government departments the scientific and technical details on matters relating to food science and technology. It brings out popular publications in various languages to acquaint the general public about the relevance of food science and technology in their daily pursuits.

Industrial utilisation of the processes, products and designs evolved at the Institute: A list of the products, processes and designs so far utilised by the industry is given in Annexure-I.

II. MANPOWER AND FINANCIAL RESOURCES (PRESENT & PLANNED) OF THE ORGANISATION:

The manpower analysis:	Present	Future
Scientists & Sci. Assistants:	365	460
Technical & Auxiliary Tech.	386	510
Supporting Technical	109	220
Administrative Staff & Supporting Staff:	277	300
Staff on temporary schemes	116	100
Total:	1252	1590

Financial Resources (in million rupees)

	1976	1977
Personnel	8.691	11.495
Raw materials	2.000	2.500
Books & Journals	0.350	0.500
Equipment & Machinery	3.580	5.921
Constructions	1.794	2.601
Maintenance & other incidental expenses	1.540	1.750
Total:	17.955	24.767

III. DESCRIPTION OF EXISTING AND PROPOSED RESEARCH AND DEVELOPMENT ACTIVITIES (if possible an annex listing ongoing and planned research programmes)

Please see Annexure - II.

IV. ACTIVITIES, IF ANY, OUTSIDE THE COUNTRY AND PRESENT STATUS OF COOPERATION WITH OTHER LOCAL AND FOREIGN INSTITUTIONS

Present status of cooperation with other local institutions:

The Institute has collaborative programmes with several autonomous institutions, (e.g. Indian Council of Agricultural Research; Indian Council of Medical Research), Universities and medical institutions in the area of post-graduate training, research and development, clinical assessment of various products developed at the institute, etc.

Cooperation with foreign institutions:

a) International Food Technology Training Centre in cooperation with the FAO of the United Nations, offering Post-graduate training leading to Master's degree,

b) Short-term courses in the areas of -

Quality Control in Food Processing Industries;
Infestation Control in Raw & Processed Foods;
Food Packaging;
Rice Technology,
Protein Foods from Oilseeds & Pulses,
Fish Processing,
Fruit & Vegetable Technology;
Aflatoxin in Oilseeds & Other food products,
Flour Milling & Baking Technology

c) Associated Institution of the United Nations University, Tokyo, Japan - on the development of post-harvest technology training programme for the developing countries at post-Master and post-Doctoral level.

V. AN ANALYSIS OF THE PROBLEMS FACED BY THE ORGANISATION IN THE DEVELOPMENT AND TRANSFER OF TECHNOLOGY AND THE SOLUTIONS FOUND

The following cost benefit analysis of the R&D efforts at CFTRI will show how it has been possible to overcome the problems of transfer of technology into the field.

(in Million Rupees)

1.	Income from sponsored research and training	17.865
2.	Income from consultancy services	0.204
3.	Income from technical and supply of technical reports	0.125
4.	Income from testing, analysis, maintenance and repair of instruments	1.512
5.	Income from sale of products manufactured in pilot plants	1.737
6.	Income from royalty and premia	2.576
7.	Benefits in terms of value	10212.000
8.	Estimated foreign exchange saved	1675.000
9.	Amount of money spent on laboratory	65.282

Similarly, a look at the list of processes developed and gone into the field would indicate the effectiveness of the Institute's Technology Transfer capability.

VI. COMMENTS AND SUGGESTIONS AS TO POSSIBLE AREAS OF JOINT RESEARCH:

Possibilities of a collaboration programme of joint research in the following areas may be feasible:

a) Post-harvest conservation and preservation of grains and other perishable commodities such as fruits, vegetables, improved fish and poultry

b) Rice and legume technology

c) Oilseed Milling and Oilseed byproduct utilisation for human consumption

d) Fish Processing and Preservation

e) Elimination of Mycotoxins

f) Fruit and vegetable preservation

g) Utilisation of Plantation Products, like tea, coffee and nuts

h) Development of Processing of Spices.

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ANNEXURE - I

INDUSTRIAL UTILIZATION OF CFTRI RESEARCH RESULTS

1. Bal-Ahar (children's food)
2. Composite Protein Food
3. Edible flour from groundnut cake
4. Groundnut milk curd
5. Groundnut protein isolate
6. Infant food from buffalo milk
7. Malted beverage based on vegetable protein (with cocoa)
8. Malted milk powder and allied products
9. Multipurpose Food
10. Protein enriched wheat flour
11. Water soluble calcium caseinate
12. Weaning Food
13. Miltone
14. High protein biscuits
15. Energy Food
16. Protein and oil from groundnuts and other Oilseeds
17. Ice-cream based on protein isolate
18. Curing of new paddy
19. Impr ved process for milling of pulses
20. Instant mixes
21. Parboiling of paddy
22. Instant rasam and sambar mixes
23. Malt from ragi
24. Rice bran oil
25. Tapioca macaroni
26. Rice crack detector
27. Baking powder formulation
28. Sago manufacture
29. Arecanut drying
30. Ballooning process for storage of moisture sensitive commodities - coffee
31. Cardamom oil (Process and Still design details)
32. Coffee adulteration testing kit

33. Ginger cocktail
34. Garlic powder
35. Improvement of storage life of cashew kernels
36. Monsooning of cherry coffee
37. Mustard powder
38. Oleoresins (spice extractives)
39. Pectin and tartrate from tamarind pulp
40. Tamarind juice concentrate
41. Manufacture of buff coloured white pepper and dried green pepper
42. Preservation of green colour in cardamom
43. Dehydration of ginger
44. Drying of walnuts
45. Processing of turmeric
46. Baker's yeast
47. Liquid banana and guava
48. Pansupari nectar
49. Pectinolytic enzyme
50. Tonic wine
51. Pre-digested protein food
52. Liquors from cashew apple
53. Wine and brandy from grapes
54. Vinegar from pineapple cannery waste
55. Detoxification process for groundnut cake or protein
56. Bottling of toddy
57. Durofume formulations
58. Durofume process for storage of foodgrains (application part only)
59. Household pesticides (Tifoon)
60. Manufacture of Lindane from benzene hexachloride
61. Pest-proofing emulsion for insect proofing of gunny bags
62. Rat-burrow fumigation
63. Revivification of gas mask canisters
64. Rodent control technique

65. Durofume application kit
66. Egg albumen flakes
67. Egg coating oil
68. Egg powder
69. Egg washing powder & egg washing unit
70. Curried meat
71. Corned beef
72. Canned chicken
73. Refining of indigenously produced sardine oil
74. Salt curing and semi-drying of mackerel
75. Corrugated fibre board boxes for bulk packaging of banana
76. Insulated fish basket
77. Improved egg transportation box
78. Deodorisation of fish odour from refrigerated railway vans
79. Hot dip treatment for colour development and checking of decay in mangoes
80. Refrigerated storage of fruits & vegetables
81. Potato chips (dehydrated)
82. Wax emulsion for longer storage of fruits and vegetables
83. Antifungal paste
84. Grading, waxing and packing of Coorg Oranges for export to Singapore
85. Harvesting, application of antifungal paste, packing and loading of bananas in shipholds for export to USSR & Japan
86. Drying of chillies (red)
87. Honey based beverage
88. Distilled oil, citrate and pectin from limes
89. Improved method for preservation of raw mango slices in brine
90. Dehydration of ripe and raw jack-fruit
91. Optimum harvest maturity for pineapples for economic utilisation

92. Dehydration of vegetables
93. Preserves and candies
94. Jams, jellies and marmalades
95. Squashes, syrups, cordials and barley waters
96. Preservation and processing of fruits and vegetables
97. Tomato products
98. Passion fruit processing
99. Utilisation of tender bamboo shoots
100. Fruit bars
101. Fruit juice powder
102. Mango cereal flakes
103. Panchamrutham (mixed fruit jam)
104. Pectin from pectinaceous materials
105. Papain from raw papaya
106. Vegetable soup powder
107. Mushroom cultivation and processing
108. Canned drinking water (produced and supplied)
109. Desiccated coconut
110. Banana chips (fried)
111. Silk worm pupae meal
112. Solvent extraction of silk worm pupae
113. Chemical for ghee testing and ghee testing kit
114. Diet for diabetics
115. Poultry feed formulations
116. Improved batch type spin cooker-cooler (pasteurizer)
117. Improved coffee filter (design details)
118. Improved vacuum tester for canned foods
119. Parboiling tanks
120. Pest-proofing machine
121. Forced circulation evaporator

122. Improved orange juice extracting machine
123. Equipment for stabilisation of rice bran
124. Cardamom drier
125. Arecanut drier
126. Vinegar generator
127. Poultry processing equipment
128. Tunnel drier
129. Pearling machinery and tempering bins for pulses
130. Paddy separator
131. Turn table for poultry slaughtering
132. Walnut drier

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ANNEXURE - II

CURRENT RESEARCH PROJECTS (1976)

1. Possibility of acute or chronic toxicity associated with feeding of sal (Shorea robusta) fat.

2. Canning and dehydration of litchis.

3. Consultancy services for setting up of wineries and distilleries for manufacture of fruit wine and brandy

4. Spice extractives from minor spices like coriander, celery, cumin, fenugreek, cinnamon, dill and turmeric.

5. Nagpur oranges - utilisation of wind falls and culls.

6. Studies on changes in lipids of coconut during processing and storage and influence of certain food ingredients on its keeping quality.

7. Physico-chemical properties of Indian rice and changes during parboiling.

8. Role of fat soluble vitamin A & K on cell membrane constituents.

9. Preparation of terpeneless citrus essential oil for flavouring purposes & possible utilisation of (a) by-products of deterpination; (b) spent peels left after oil recovery.

10. Studies on urinary and skin mucopolysaccharide complexes in clinical case of protein-calorie malnutrition/ vit.A deficiency.

11. Studies on carbohydrates of groundnut and other oilseeds.

12. Study of the effect of process variables on the yield and quality of indigenous rice flakes (awalakki and beaten rice).

13. Preparation of bland groundnut flour and protein concentrate for use in milk like preparation and textured protein foods.

14. Studies of the methods for isolating protein from whole seed, screw press cake and solvent extracted meal of groundnut.

15. Studies on leaf protein.

16. Textured vegetable proteins like paneer.

17. Studies on preparation of detoxified rape seed concentrate and isolate.

18. Development of microbial cultures for the production of threonine, aflatoxin degrading enzyme and glucose isomerase.

19. Fermented beverages - fruit wines and brandy.

20. Studies on the distn. of fungal toxins in food materials and their significance to human health and development of preventive measures

21. Malting and brewing characteristics of barley and malt.

22. Studies on sanitation of food plants and food service establishments.

23. Development of beverage concentrates for the soft drink industry.

24. Fumigants for processed foods: utilisation of some selected fumigants for insect control and hygiene in processed foods, dry fruits and nuts, evaluation of their residues and safe dietary levels.

25. Development of selective rodenticides and improvements of anticoagulants for the control of warfarin resistant rodents.

26. Studies on chemical pollution of food materials & developing methods of decontamination of overcoming public health hazards.

27. Design and fabrication of a continuous extraction plant for instant tea.

28. Standardisation of harvesting, drying and milling technology for village level processing of paddy.

29. Processing of sorgum, maize, jowar and millet grains for better consumer acceptability and wide spread food uses.

30. Meat quality characteristics of bannur lamb.

31. Studies on the factors affecting the quality of raw prawns for subsequent processing.

32. Processing and utilisation of wheat germ - a byproduct of flour milling industry.

33. Development of packages based on traditional packaging material .

34. Development of facilities for testing and evaluation of rigid and semi-rigid metal, glass and plastic container for their suitability in the packaging of foodstuffs and to extend the package/packaging material testing facilities to the industries.

35. Design and development of functional and economical consumer packages for whole ground spices and oxygen sensitive fatty foods.

36. Development of an industrial scale continuous fermentation process for production of food and fodder yeast from molasses.

37. Development of industrial scale tray fermentation process for the production of pectinase.

38. Development of an industrial scale submerged fermentation process for the production of pectinase.

39. Standardisation and streamlining of post-harvest processing of walnuts in Kashmir valley.

40. Development of (a) bread spread and butter like products based on nutmeat (walnut, cashewnut) and unconventional fats and oils and (b) nutritional butter substitutes.

41. Evaluation of products developed at the institute.

42. Quality in meat, fish and poultry products.

43. Formation and changes in aroma compounds of oils and fats.

44. Evaluation of quality in pepper, ginger and their oleoresins.

45. Biochemical changes in fruits during ripening and storage at low temperature.

46. Metabolic and biochemical aspects of spices.

47. Biochemical studies with minor constituents of technical HHC.

48. Changes in enzyme system in nutritional stress conditions.

49. Nutritional and toxicological studies with animals on petroleum yeast.

50. Studies on regulatory enzymes in the biosynthesis of lysine by micrococcus glutamicus and in plant materials.

51. Basic studies on enzymes in relation to food.

52. Chemical and enzymatic modification of vegetable proteins.

53. Determination of optimum harvesting, maturity, packing, transportation and storage conditions for apples.

54. Studies on the control of microbial spoilage in monsoon mandarins from Coorg area.

55. Economics of mushroom cultivation (pleuratus flabellatus).

56. Evaluation of indigenous tinplate containers for F&V products.

57. Cost estimate and sensory evaluation of osmotic dehydration of fruit slices.

58. Studies regarding brine stock of different varieties of mango.

59. Investigation on serum lowering effect of oil-sardine fish and its oil.

60. Production of fungal proteases suitable for food processing.

61. Suitability of plastic containers for packing rum.

62. Thermal processing to improve quality and yield of certain varieties of fish.

63. Incidence and source of microbial contamination of meat as sold in the market.

64. Studies on lectins (pyto haemagglutinins) from edible legumes, cereals and oilseeds.

65. Studies on thermal processing of tropical fruits.

66. Chemical and enzymatic changes in tropical and sub-tropical fruits during ripening and storage at low temperature.

67. Standardisation of methods for freezing of fruits and vegetables.

68. Scaling up trials on meat gravy formulations.

69. Scaling up of production of comminuted meat products particularly loaf type sausages.

70. Toxicological studies on turmeric.

71. Studies on prepackaged meat cuts - bacteriological conditions and shelf life.

72. Studies on frying of foods in oils.

73. Studies on biochemical and nutritional qualities of some germinated legumes and their utilisation.

74. Formulation and evaluation of infant foods.

75. Development of equipment for improving processing of cashewnut.

76. Development of a process for the preparation of cottonseed protein isolate and study of its properties.

77. Standardisation of conditions for steeping preservation of fresh vegetables suitable for Indian style cooking.

78. Screening of tomato varieties for their suitability for the manufacture of tomato ketchup.

79. Screening of new varieties of various vegetables like carrot, cabbage, cauliflower, onion, ladies finger etc. developed by Punjab Agricultural University, Ludhiana for assessing their quality characteristics and suitability for processing.

80. To standardise recipe, improve the method of preparation and packing of conventional savoury food items like Vadian and Mankad Vadi for North India.

81. Evaluation of petroleum yeast as a source of protein for poultry.

82. Studies on quality of chicken sticks and patties.

83. Hydrolysates from waste of fish and slaughter house.

84. Adoptation of Modern Dhal Milling methods for processing Bengal gram, Green gram, and Black gram.

85. Physiological changes in important varieties of potatoes of the region from both cold storage and underground storage to study the effect of cold storage on canning.

86. Microbiological status and safety of fresh and cured marine fish.

87. Scaling up of cleaning and salting of sheep casing.

88. Chemical and biochemical studies on lipids of legumes and cereals.

(Some of the projects will continue beyond 1976)

PLANNED PROJECTS FOR 1977 & 1978

1. Improvement in Meat Quality.

2. Meat handling and meat by-products utilisation.

3. Processed products from chicken and meat.

4. Handling, chilling, freezing and marketing of fish.

5. Processed fish products.

6. Utilisation of [illegible] waste and new protein sources for feeds.

7. Basic and developmental studies on the enzymes operative in the biosynthesis of nutritional factors or in the processing of food materials (enzyme for food industries)

8. Laboratory and scale up studies on the fermentative production of alcoholic and non-alcoholic beverages and food and fodder yeast and setting up wineries and distilleries and other fermentation industries in the country.

9. Toxic compounds in food materials and the development of processes for their estimations or inactivation.

10. Biochemical changes in nutritional deficiencies and other conditions.

11. Improvements in processing of products from spices, nuts and tubers.

12. Evaluation of quality of spices.

13. Preparation of natural and synthetic aroma concentrate for indigenous development of food and beverage flavourings.

14. Improvements in the processing of tea, coffee and cocoa.

15. Development of appropriate technology for village level processing and utilisation of cereals, millets and pulses.

16. Process development, stabilisation and utilisation of fatty foods.

17. Development of low cost foods based on vegetable proteins.

18. Preservation of apples and mangoes.

19. Fruit and vegetable product development and utilisation of by-products.

20. Preservation and processing of tubers.

21. Process design and systems engineering.

22. Design, development and fabrication of individual process equipment.

23. Design, development of instrumentation facilities for research projects.

24. Safer utilisation of existing pesticides and development of simple techniques of pest control in rural areas.

25. Development of packages from indigenously available raw materials for traditional foods.

26. Improvements in Cardamom Technology.

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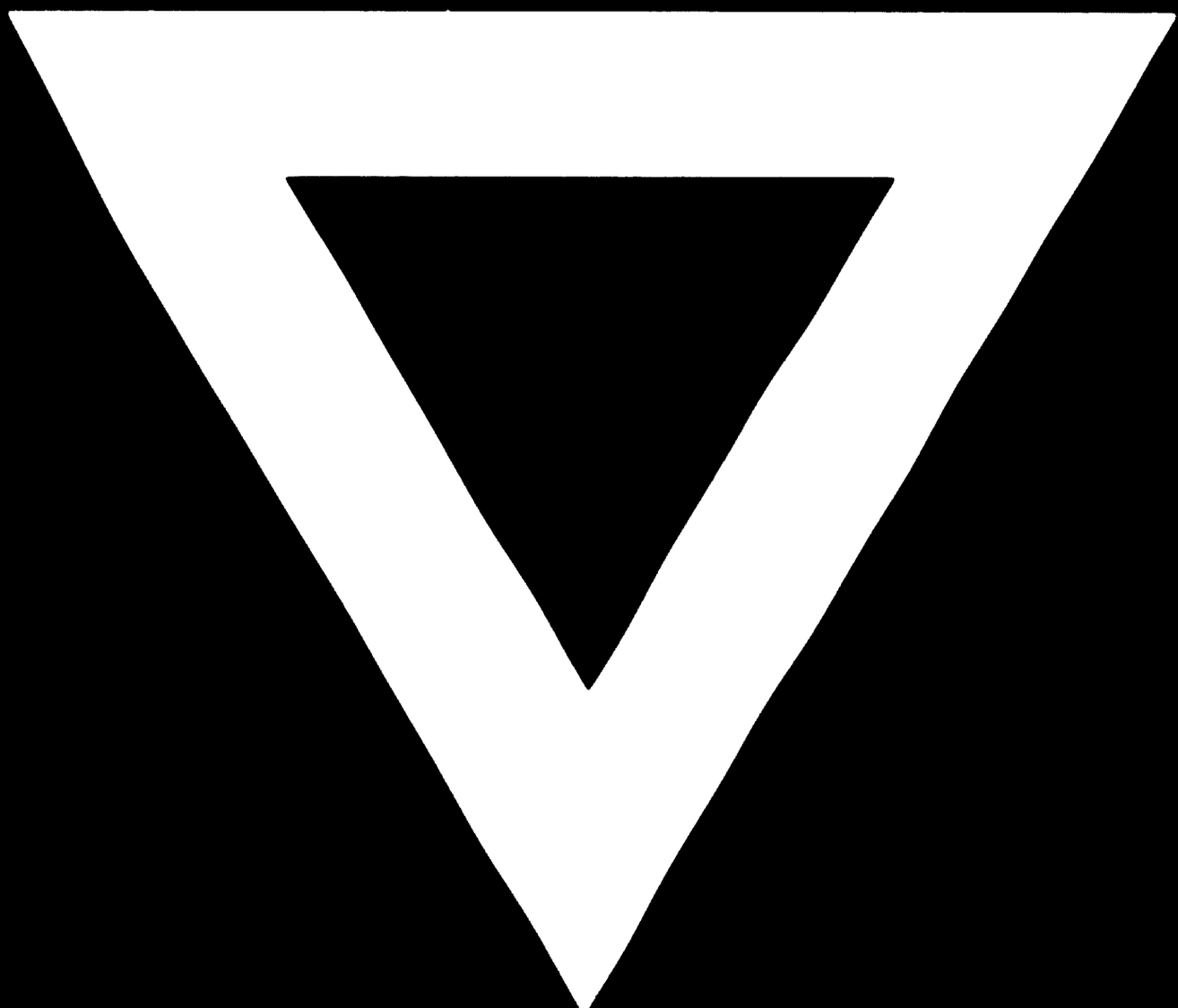

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