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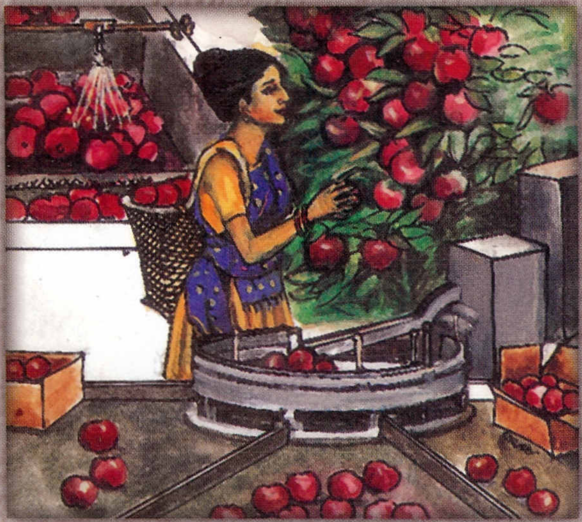

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CONTENTS

cereals (wheat, rice, barley, malt and maize). The leading importing countries are highlighted noting their relative share of world imports.

204 KASHYAP, P. 1991. **Marketing rural products in India**. *Small Enterprise Development (United Kingdom)*, 2: 2, 51-55.

205 RAO, BR; RAO, DP. 1990. **Agricultural commodity transportation in India - a bird's eye view**. *Agricultural Marketing*, 33: 2, 31-36; 1 tab.

An efficient transport system is a crucial component of a marketing system for perishable agricultural products. The article outlines the role of the transportation system in Indian agriculture and gives a product-wise account of the modes of transport used. Products include cereals, pulses, oilseeds and oils, fruits, vegetables, spices and drugs. Natural fibres and livestock are also discussed. Generally, animal-driven carts and trucks are used domestically and ships are used internationally. The need to review the existing infrastructure is emphasized. It is argued that commodity flows can be improved significantly.

206 THAKUR, DS; CHAUHAN, SK; SHARMA, KD. 1988. **Efficiency and weaknesses of regulated markets**. *Indian Journal of Agricultural Marketing*, 2: 1, 48-59.

The paper highlights the weaknesses and efficiency as well as remedies for improving the functioning of regulated markets, with reference to Himachal Pradesh and Gujarat states. Regulated markets in Himachal Pradesh were found to be much more developed than in Gujarat. In many cases the regulated markets exist only on paper as the act has not been implemented in practice. Various marketing problems were faced by farmers due to lack of sufficient facilities in the markets, delays in auctioning and unloading of trucks for several days, delayed payment, deductions made on the pretext of spoilage, low grade, defective packaging, etc., and the charging of unauthorized market charges and a high rate of commission from both buyers and sellers.

CEREAL GRAINS

Postharvest handling

207 AGRICULTURAL PROJECT SERVICE CENTRE, KATHMANDU, NEPAL. 1983. **Nepal postharvest food grains sector study**.

208 ALL INDIA CO-ORDINATED ICAR SCHEME FOR STUDIES ON HARVEST & POST HARVEST TECHNOLOGY INDIA, IDRC-ICAR OPERATIONAL RESEARCH PROJECT IN POST HARVEST TECHNOLOGY. 1982. **Highlights of post harvest research in India 1972-1982**. 40 p.

This report includes sections on harvesting technology (rice, sorghum, groundnut, acoustic type moisture indicator); cleaning and grading technology (T NAV winnower with scalper, tested on paddy and sorghum; rotary screen grain pre-cleaner, tested on wheat and paddy); drying technology (solar cabinet drier; agricultural waste-fired drier); storage technology (coaltar drum bin and Hapur bin; Udaipur bin; Chittore stone bin; double-walled polyethylene sandwiched bamboo bin; nanda bin); shelling and decortication technology (pedal-operated dehusker sheller, power-operated maize husker sheller; groundnut decorticator); milling technology. Technology under research and ready for research is listed.

209 BAINS, GS. 1989. **Grain processing in India**. *Trends in food science and technology: Proceedings of the Second International Food Convention*. (Mysore: 1988: 18-23 Feb.). Association of Food Scientists and Technologists, p. 319-326; 15 ref.

Grain processing techniques and the developing trends towards more refined products are discussed.

210 BANSAL, NK. 1989. **Solar crop drying: status and prospects**. *Renewable energy for rural development. Proceedings of the national solar energy convention*. (Hyderabad: 1988: 1-3 Dec)/edited by VVN Kishore; NK Bansal. New Delhi: Tata McGraw-Hill, p. 1385-1399.

Developments in solar crop drying technology are described, from solar kilns for drying timber to cabinet, tunnel and shelf driers for grain and flat-plate solar air heating collectors. A case study of grape drying to produce raisins is presented. The parameters influencing the drying process are discussed and variations of solar drying methods are illustrated. Floor drying with different covers (PVC foils) produce different colour quality. A multilayer drier with air heating collector and fan is illustrated. Prospects for solar fruit crop drying in India are considered.

211 CONWAY, G. 1978. **Food grain in Nepal: an overview of the post harvest sector**. Nepal Food Corporation, Nepal.

212 SHANKARA, R; NARASIMHA, HV. 1989. **Processing systems for cereals and pulses: trends and perspectives.** *Trends in food science and technology: Proceedings of the Second International Food Convention.* (Mysore: 1988: 18-23 Feb. Mysore: Association of Food Scientists and Technologists, p. 305-315; 42 ref.

India produces about 150 million tonnes of food grains, comprising 40% rice, 30% wheat, 22% minor cereals and 8% legumes. All these undergo primary and/or secondary processing before consumption. Various processing systems which have evolved and which are particularly suitable for developing countries are discussed.

213 SINGHAL, OP; TOMAR, SS. 1984. **Harvest and postharvest management of crops in semi-arid tropics.** *Agricultural Mechanization in Asia, Africa and Latin America*, 15: 1, 65-72; 23 ref.

Existing harvest and post-harvest management patterns are reviewed and problems are identified. Aspects considered include cropping patterns for selected regions and soil types in India, early planting and harvesting of rainy season crops, and grain losses during harvesting and post-harvest treatment of maize, millet, sorghum and legumes. Labour requirements and mechanization are discussed, and areas for future research identified.

214 WOODWARD, AM. 1986. **Report of a mission to Thailand, Malaysia and India: Regional Network on Grain Postharvest Technology, 8 Sep - 3 Oct 1986.** 21 p.

Storage

215 BALA, BK. 1991. **Simulation of temperature changes during storage of grain using finite element method.** *Bulk Solids Handling, Germany*, 3: 1.

216 BALA, BK. 1994. **Studies on storage of food grains in Bangladesh.** *Proceedings of the 6th International Working Conference on Stored-Products protection.* (Canbera: 1994: 17-23 Apri).

217 FERNANDO, MD; PALIPANE, KB; ADHIKARINAYAKE, TB. 1988. **Improvement of farm level grain storage methods in Sri Lanka.** *Tropical Post Harvest Technology. Sri Lankan Journal of Post Harvest Technology*, 1: 1, 47-67.

218 HNG-FAO, RURAL SAVE GRAINS PROJECT, NEPAL. 1986. **Review on storage of food grains and practices in Nepal.** Technical Paper - 3.

219 MAHANDHAR, RB; RIJK. 1984. **On farm grain storage in Nepal.** *Agricultural Mechanization in Asia, Autumn Issue.*

220 MINISTRY OF AGRICULTURE, RURAL SAVE GRAIN PROGRAMMES, LALITPUR, NEPAL. 1986. **Review of traditional farm level grain storage structures in Nepal and recommendations for development.**

221 PRASAD, T; PATHAK, SS. 1987. **Impact of various storage systems on biodeterioration of cereals.** *Indian Phytopathology*, 40: 1, 39-46; 19 ref.

Details are given of the effects of different storage systems used by farmers in Bihar and the common deterioration fungi associated with wheat, maize and barley under these conditions. The effects of the fungi on the starch, sugar and protein contents of the grain are recorded and the results discussed in relation to the storage systems.

222 REED, C. 1992. **Development of storage techniques: a historical perspective.** *Storage of cereal grains and their products; 4th edition*/edited by DB Sauer. American Association of Cereal Chemists, Minnesota. p. 143-156; 31 ref.

Storage in the middle ages, effects of colonization and industrialization, and the development of modern storage techniques are covered. Storage structures in use today in developing countries and areas such as Africa, Central America, the Caribbean and India are described.

223 ROY, MK; PRASAD, HH. 1993. **Gamma-radiation in the control of important storage pests of 3 grain legumes.** *Journal of Food Science and Technology - Mysore*, 30: 4, 275-278.

A dose of 1 kGy of gamma radiation completely killed adult pulse beetle (*Callosobruchus chinensis Linn*) within a week, but the dose of 0.5 kGy required two weeks to achieve the same level of mortality. For six month storage, 1.0 kGy dose was effective for control of natural infestation of mung beans and gram by *C. chinensis* alone. The dose was also sufficient for the management of weevilling in gram and lentil, which were additionally infested with *C. chinensis*, rust red flour beetle (*Tribolium castaneum Herbst*), and lesser grain borer (*Rhizopertha dominica Fabricius*). For short (one and half months) storage of mung bean and lentil, a dose of 0.25 kGy was adequate. The test of significance for doses of radiation, storage periods and their interactions, however, indicated that 1.0 kGy is the preferred dose for the control of weevilling during storage up to 6 months.

224 SINHA, BP; GANESH, KC; PANDEY, PC. 1988. **Food grain handling and storage system.** *Country paper, presented at seminar on Postharvest system held in Hnghau province China.*

225 WILSON, TL. 1974. **Concrete silos reduces Nepal's grain loss.** *Front Lines (Nepal)*, 12: 6.

Storage decay

226 BADSHAH, A; KLOPFENSTEIN, CF; BURROUGHS, R; SATTAR, A. 1992. **Effect of gamma irradiation on field and storage fungi of wheat, maize and soybean.** *Chemie, Mikrobiologie, Technologie der Lebensmittel (Germany)*, 14: 1-2, 57-61.

227 CONWAY, J. 1985. **Insect and other arthropods recorded on stored food commodity in Nepal and Bhutan.** *Tropical Science*, 26: 3.

228 DATTA, M; BHATTACHARYA, A. 1990. **Sterility effect of acetic acid on the stored grain pests.** *Environment and Ecology*, 8:1B, 320-323; 13 ref.

The effect of 1% acetic acid as a sterilizing agent on adult males of the curculionid *Sitophilus oryzae* and on pupae of *Callosobruchus chinensis* was studied in the laboratory. A reduction in sperm number and a correlation between sperm count and cell division index in the testis of exposed males were observed.

229 DEPARTMENT OF AGRICULTURE RESEARCH, LALITPUR, NEPAL. 198? **Reports on wheat, maize and rice post harvest losses in Nepal; rural save grain programme.**

230 GANESH, KC. 1988. **On farm cereals post harvest loss assessment study in Nepal.** *First National Science and Technology Conference*. (1988: April 24-30).

231 IRSHAD, M; GILLANI, WA; GUL, F. 1991. **Relative resistance in some wheat varieties/genetic lines to red flour beetle and lesser grain borer.** *Pakistan Journal of Agricultural Research*, National Agricultural Research Centre, Islamabad (Pakistan). Entomological Research Labs. 12: 1, 51-54.

232 JOOD, S; KAPOOR, AC; SINGH, R. 1993. **Available carbohydrates of cereal grains as affected by storage and insect infestation.** *Plant Foods for Human Nutrition*, 43: 1, 45-54.

Total soluble sugar, reducing sugar, non-reducing sugar and starch contents of wheat, maize and sorghum grains were affected adversely at 25, 50 and 75% insect infestation caused by *Trogoderma granarium Everts* and *Rhizopertha dominica Fabricius*, separately and mixed population. *R. dominica* caused significant ($P < 0.05$) reduction in available carbohydrates at 50 and 75% infestation levels whereas *T. granarium* achieved similar effect at 75%. Mixture of both insect species caused intermediate losses. Storage of cereal grains up to 4 months resulted in substantial increase in sugars and decrease in starch content, but storage for a shorter period of time did not cause any significant changes in levels of carbohydrates.

233 NAYEEMULLAH, M; NIAZ, I. 1982. **Deterioration of stored grains due to fungi.** *Progressive Farming*, 2: 5, 17-19.

General information is given on fungi infecting stored grains including losses caused by fungi, pre-storage fungi (field infection) and storage fungi. Factors promoting development of storage fungi are outlined and methods of control, safe storage criteria and mycotoxins are discussed.

234 RAJU, P. 1984. **Storage pest menace - how to combat? Role of grain protectants in its perspective.** *Pesticides*, 18: 8, 16-21; 21 ref.

Various types of preventive measures adopted by farmers in India for preserving stored grains (including both cereals and pulses) are reviewed. In practice, small farmers are often unable to acquire metal bins and concrete storehouses for storage and have to concentrate on chemical treatment of the grain or of existing structures. Grain protectants are discussed in detail, with special reference to *Rhyzopertha dominica*. A list is given of pyrethroids, organochlorine and organophosphorus compounds suitable for application. Admixture of insecticides with grains may be extended to pulses but not to flour or milled rice; the insecticide acts mainly against free-living arthropods and must be absorbed into the endosperm to kill larvae feeding within the kernels. Malathion is still the most widely used compound for this purpose, followed by pirimiphos-methyl. Other preventive and control measures include residual spraying of the structure of the storehouses, fumigation, treatment of empty storage bags and treatment of the outer surfaces of packaging materials with insecticides or insect repellents.

235 RAO, BSN; RAO, VS; RAMAKRISHNA, Y; BHAT, RV. 1989. **Rapid and specific method for screening ergosterol as an index of fungal contamination in cereal grains.** *Food Chemistry*, 31: 1, 51-56; 8 ref.

Ergosterol is used as an effective biochemical marker for fungal contamination in food grains. A simple and rapid qualitative method for screening ergosterol in cereal grains is described. The method involves the formation of a highly fluorescent addition product of ergosterol after an iodination reaction. Iodinated ergosterol shows a characteristic greenish-blue fluorescence under long-wave ultraviolet light. Further, chemical confirmatory tests are also incorporated for identifying ergosterol. The method developed may be used in the food industry, and for routine surveillance of cereal grains for fungal contamination.

236 SAXENA, BP; SHARMA, PR; THAPPA, RK; TIKKU, K. 1992. **Temperature induced sterilization for control of three stored grain beetles.** *Jrl. of Stored Products Research*, 28: 1, 67-70.

The effects of exposing 1-, 2- and 3-day-old pupae of the dermestid *Trogoderma granarium*, the tenebrionid *Tribolium castaneum* and the bruchid *Callosobruchus chinensis* to temperatures of 30, 40 and 45°C for 24, 48 and 72 h for each age-group were determined. Observations of adult emergence and their progeny revealed that although all temperatures were effective in causing sterility, exposure at 45°C was particularly effective in suppressing adult formation. With *T. castaneum* and *C. chinensis*, adult emergence was totally prevented by 48- and 72-h exposures at 45°C. With *T. granarium*, the inhibitory effect was greater with male pupae and the resultant adults were completely sterile.

237 SHUKLA, RM; CHAND, G; SAINI, ML. 1992. **Laboratory evaluation of effectiveness of edible oils against three species of stored grain insects.** *Plant Protection Bulletin Faridabad*, 44: 1-2, 14-15; 7 ref.

Wheat grain was treated with various edible oils and the effects of these treatments on adults of *Sitophilus oryzae*, *Rhizopertha dominica* [*Rhyzopertha dominica*] and *Tribolium castaneum* were recorded in the laboratory. *T. castaneum* was unaffected by any of the oils. The order of toxicity of the oils for *S. oryzae* in ascending order was dalda (20.00% mortality), coconut (69.05% mortality), palm, mustard [*Brassica sp.*], corn [maize], soyabean, sesame, rape and groundnut (90.48% mortality) and for *R. dominica* was palm (3.33% mortality), soyabean, groundnut, sesame, mustard, rape and corn (56.67% mortality). Dalda and coconut had no effect on *R. dominica*.

238 SINGHAL, OP; THIERSTEIN, GE. 1981. **Loss prevention of grains through harvest and post harvest technology.** *Agricultural engineering in national development. Proceedings of an international conference.* (Universiti Pertanian Malaysia, Serdang, Selangor, Malaysia: 1979: 10-15 September)/edited by SL Choa et al.. p. 341-356; 14 ref.

Grain losses during and after harvesting are evaluated for each of the operations, viz. harvesting 1-3%, handling 2-7%, threshing 2-6%, drying 1-5%, storage 2-6%, and milling 2-10%. Solutions to these problems were developed for threshing, maize shelling, grain cleaning, natural and artificial drying, processing and storage of crops including maize, rice, sorghum and groundnuts.

239 SULAIMAN, ED; HUSAIN, SS. 1984. **Chemical control of *Aspergillus flavus* and *Penicillium cyclopium* in storage.** *Pakistan Journal of Scientific and Industrial Research*, 27: 6, 363-365; 8 ref.

Grains inoculated separately with *A. flavus*, *P. cyclopium* and a mixture of the 2 spp. were treated with 1% Luprosil (99.9% propionic acid). After 3 months storage, grains yielded almost no inoculated fungi when surface disinfected and plated on media. Grains inoculated but not treated yielded the inoculated fungi in more than 90% of cases. One percent acetic acid when applied to the inoculated grains was less effective than Luprosil in inhibiting the fungi.

240 TABASSUM, MA; AHMAD, SI. 1989. **Damage to foodgrains during storage and its prevention.** *Progressive Farming*, 9: 2, 26-29.

This article on damage to food grains during storage and its prevention includes notes on moisture, temperature, fungi (6 species), insects (14 species), rodents, birds, warehouse construction, aeration, and fumigation.

241 VIJAY SINGH. 1991. **Effect of the protein fraction from cashewnut kernels (*Anacardium occidentale L.*) on the development of some stored grain pests.** *Journal of Insect Science*, 4: 2, 127-130.

Marketing

242 AGRICULTURAL PROJECT SERVICE CENTRE (APROSC), KATHMANDU, NEPAL. 1982. **Food grain marketing and prices policy study vol. (iii).**

243 HARRISS, B. 1990. **Another awkward class: merchants and agrarian change in India.** *Food question: profits versus people?*/edited by H Bernstein;

B Crow; M Mackintosh; C Martin. London: Earthscan, p. 91-103.

244 KAINATH, GS. 1982. **Foodgrains marketing system in India**. New Delhi: Associated Publishing House, 124 p.

The study analyzes the salient organizational and operational features of the food grain marketing system in the wake of a technological breakthrough in Punjab, to test existing hypotheses and generate new ones. Specific objectives were to examine: (1) the impact of the expanded marketed surplus on the pattern of market arrivals; (2) the concentration of marketed surplus of foodgrains for different farm situations; (3) factors affecting marketed surplus and to estimate the elasticity of production marketed surplus of food grains; (4) variations in food grains prices; (5) the extent of interdependence in inter-market price formation; and (6) to examine the impact of state intervention in the foodgrains marketing system. Both primary and secondary data were used. The analysis supports the hypothesis that the pattern of marketed surplus as a percentage of total production as between wheat and paddy was not the same on the three different farm size groups. The average difference in per acre marketed surplus of wheat and paddy was significant only in the case of the small-medium and medium-large groups. Procurement policy has significantly affected the sales of wheat and paddy during different seasons, post-harvest, mid-season and lean periods.

245 KRISHNAJI, N. 1991. **Agricultural price policy in Asia**. *Indian Journal of Agricultural Economics*, 46: 2, 186-192.

In developing countries, the State has assumed a paramount role in bringing about economic transformation in the post-colonial phase, with varying degrees of intervention in the market and of planning at central level. The prevalence of poverty, low standards of living and the inadequacy of the normal market forces to generate progress at a rapid rate to satisfy the basic aspirations of the population were the major problems encountered by the ruling parties at the end of foreign political domination. Land reforms as could be implemented under existing political constraints yielded poor results in terms of overall growth. The provision of price incentives to promote agricultural growth within the structure of the existing pattern of political power and of property in land and its use thus emerged as a feasible solution to the ruling governments. The experience of India and the Philippines are reviewed based mainly on the studies of Bhalla and Tyagi (1989) and Intal and Power (1990) and an FAO Study (1989). As far as India is concerned, price policy in the case of rice and wheat has gone a long way in realizing the objectives set by the policy makers. Despite many institutional constraints, price policy has also succeeded in ensuring a more rational utilization of productive resources. But inter-regional price disparities continue to be on the high side. Intal and Power include political factors in analysing the Philippine experience and point out that there has been no political party that has represented the particular interest of any economic groups. After a detailed analysis of a number of sectors (rice and maize, sugarcane and coconut), they conclude that price intervention has not systematically been designed to hinder or harm the agricultural sector. In the Philippines, as in India, the political leadership comes from the social elite class and the interests of this class receive high priority in policy making.

246 KUMARI, R. 1991. **Impact of mechanisation of foodgrain marketing efficiency: a case study in Bihar**. *Indian Journal of Agricultural Marketing*, 5: 1, 9-15.

The objectives of this study were: (1) to analyse the extent of mechanization; and (2) to evaluate the impact of mechanization on marketing efficiency at Naugachia agricultural market in Bihar state, India. This market had been recently developed under the World Bank Market Construction Project. The findings of the study show that the equipment for mechanizing marketing operations was adequate but that its utilization has not been very satisfactory. Analysis of transport use pattern of arrivals and despatch shows that the composition of mode of transport has changed towards mechanization. The total volume of arrivals significantly increased in the case of wheat and maize as a result of mechanization of marketing operations. The standardization of goods in terms of grading and cleaning showed some improvement.

247 WICKREMASINGHE, YM. 1988. **Production and marketing of maize from Anuradhapura District, Sri Lanka**. Department of Agriculture, Peradeniya (Sri Lanka). Diversified Agricultural Research Project. 42 p.

WHEAT

Postharvest handling

248 DHINDSA, KS; SINGH, J. 1983. **Marketed surplus of wheat and paddy by farm size in Punjab - a case study**. *Margin*, 15: 2, 81-88.