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Coordinator's Report

2009 - 2010

for
XXVIII WORKSHOP of
AICRP on POST HARVEST TECHNOLOGY
(28 - 31 October 2010)

held at

**CENTRAL INSTITUTE OF AGRICULTURAL
ENGINEERING
BHOPAL**



**CENTRAL INSTITUTE OF POST HARVEST
ENGINEERING & TECHNOLOGY (ICAR)**
LUDHIANA - 141 004

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October 28, 2010
CIAE, Bhopal

(S. K. Nanda)
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AICRP ON POST HARVEST TECHNOLOGY

Background

The All India Coordinated Research Project on Post Harvest Technology was launched by the Indian Council of Agricultural Research, Department of Agricultural Research & Education, Ministry of Agriculture, Government of India, in September 1972. Coordinating Cell of the Project was established in the Division of Agricultural Engineering at Indian Agricultural Research Institute, New Delhi. In the beginning, the Scheme was started at ten locations, namely: PKV Akola, UAS Raichur (later shifted to Bangalore), CRRRI Cuttack, TNAU Coimbatore, GAU Junagadh, JNKVV Jabalpur, IIT Kharagpur, PAU Ludhiana, GBPUA&T Pantnagar, and RAU Udaipur.

The Co-ordinating Cell of the Project was shifted to CIAE Bhopal in February 1976. During the V Five-Year Plan, four more centres were added. These were: CIAE Bhopal, CAZRI Jodhpur, CTCRI Trivandrum and CPCRI Kasargod. Later, during the VI Five Year-Plan period, Feasibility Testing and Extension (FTE) Centres were started at 3 locations namely, APAU Bapatla, RAU Pusa, and NDUA&T Faizabad. One R&D centre was also started at AAU Jorhat. With the establishment of the Central Institute of Post Harvest Engineering & Technology at Ludhiana, the Co-ordinating Cell was further shifted from CIAE Bhopal to CIPHET Ludhiana in December 1990. The centre located at CRRRI, Cuttack was also shifted to OUA&T Bhubaneshwar in the year 1995. During IX Plan, three more centres viz. VPKAS Almora, IGAU Raipur and SKUAS&T Srinagar has been established. In X Plan EFC, eight new centres have been approved and four existing centres had given enlarged mandate on dairy, fisheries, horticulture, and meat products. Besides it five ongoing centres of AICRP on Jaggery and Khandsari has been merged with AICRP on PHT w. e. f. April 2004. Thus by the year 2004, the Project had been operating from 33 centres and one sub-centre in India covering almost all states and the agro-climatic regions. *In the XI Plan EFC, four new centres (viz. 1. CAU, Gangtok 2. BAU, Ranchi 3. MAFSU, Mumbai and 4.KVA&FSU, Mangalore) have been approved in principle (official communication awaited).* The Project Coordinators for the Project so far have been: (1) Prof. T.H. Nirmal (1972 - 1977), (2) Dr. Anwar Alam (1978 - 1981), (3) Dr. Nawab Ali (1981-1985), (4) Dr. B. D. Shukla (1985 - 1989), (5) Dr. R. P. Kachru (1989 - 1991), (6) Dr. Jai Singh (1991 - 1996), (7) Dr. B. S. Bisht (1996 - 2002), (8) Dr. S. M. Ilyas (2002-2005) and (9) Dr. S.K. Nanda (2005 onwards).

Our Mandate

- To develop location and crop/commodity specific post harvest technologies for minimization of quantitative and qualitative losses to produce in agriculture and allied sectors.
- To adapt and develop improved post harvest processes and equipments for value addition to food grains and other produce at rural threshold for higher income and generation of rural employment.
- To develop processes and equipments for economic utilization on bio-wastes and byproducts.
- To conduct operational research and multi-location trials on developed technologies to identify technical, financial, managerial and social constraints for better market acceptability to technologies.
- To establish need based agro-processing centres to assure better economic returns to the farmers from their marketable surpluses.
- To assess, refine and transfer proven technologies.

Specific Objectives of the Project

1. To study the prevailing post harvest practices and identify unit operations, equipment and their components that need improvement or substitution, adequacy and inadequacy of the prevailing practices.
2. To develop and adopt farm level cleaners, graders and dryers for cereals, pulses, oilseeds, plantation crops, tubers, other field crops, livestock produce and fish.
3. To develop simple processes, low cost equipment and pilot plants for farm/village level processing of food grains, oilseeds and other crops for rural consumption, as well as selling value added products to semi-urban and urban areas for better economic returns.
4. To develop simple processes and equipment farm/village level for better economic utilization of bio-wastes and by-products as food/feed/fuel etc. for increasing profitability of the commodity and income of the farmer.
5. To undertake studies on techno-economic feasibility and economical viability of on farm/village level processing industries and other enterprises.
6. To field evaluate laboratory proven technologies and carry out operational research trials on the developed technologies for villages to identify technical, managerial and social constraints and take remedial measures before releasing for popularization.
7. To facilitate creating of post harvest technology consciousness and transfer of proven technologies in selected villages and monitoring its effects on economics and social development.
8. To generate income and employment in rural areas through adoption of proven technologies and equipment through establishing agro-processing centres.

Location of the Cooperating Centres

State Agricultural Universities

1. College of Agricultural Engineering
Dr. Punjabrao Deshmukh Krishi Vidyapeeth,
Akola (Maharashtra)
2. University of Agricultural Sciences,
Bangalore (Karnataka)
3. College of Agriculture,
Acharya N.G. Ranga Agri. University,
Bapatla (Andhra Pradesh)
4. College of Agricultural Engineering,
Orissa University of Agri. & Technology,
Bhubaneshwar (Orissa)
5. College of Agricultural Engineering,
Tamil Nadu Agricultural University,
Coimbatore (Tamil Nadu)
6. College of Agricultural Engineering,
Acharya Narendra Dev University of Agri. & Technology,
Faizabad (Uttar Pradesh)
7. College of Agricultural Engineering,
Jawahar Lal Nehru Krishi Viswa Vidyalyaya,
Jabalpur (Madhya Pradesh)

8. College of Agriculture,
Assam Agricultural University,
Jorhat (Assam)
9. College of Agricultural Engineering,
Junagadh Agricultural University,
Junagadh (Gujarat)
10. Indian Institute of Technology,
Kharagpur (West Bengal)
11. College of Agricultural Engineering,
Punjab Agricultural University,
Ludhiana (Punjab)
12. College of Technology,
G.B. Pant University of Agri. & Technology,
Pantnagar (Uttaranchal)
13. College of Agricultural Engineering,
Rajendra Agricultural University,
Pusa (Bihar)
14. Indira Gandhi Krishi Vishwa Vidyalaya,
Raipur (Chhattisgarh)
15. Sher-e-Kashmir University of Agri. Sciences and Technology,
Srinagar (Jammu & Kashmir)
16. College of Technology & Agri. Engg.,
Maharana Pratap Agricultural University,
Udaipur (Rajasthan)
17. Faculty of Agricultural Sciences
Aligarh Muslim University
Aligarh (Uttar Pradesh)
18. College of Agricultural Engineering
CCS Haryana Agricultural University
Hisar (Haryana)
19. Kerala Agricultural University
KCAET, **Tavanur (Kerala)**
20. College of Horticulture
Dr. Y.S. Parmar University of Horticulture and Forestry,
Nauni, **Solan (Himanchal Pradesh)**
21. Tamil Nadu Veterinary and Animal Sciences University,
Chennai (Tamil Nadu)
22. Rajasthan Agricultural University
Agricultural Research Station
Durgapura, **Jaipur (Rajasthan)**

23. West Bengal University of Animal and Fishery Sciences,
Kolkata (West Bengal)
24. College of Agricultural Engineering and Technology
University of Agricultural Sciences
Raichur (Karnataka)
25. Regional Sugarcane & Jaggery Research Station,
Kolhapur (Maharashtra)
26. Sugarcane Research Station : Assam Agricultural University,
Buralikson (Assam)
27. Assam Agricultural University
Khanapara (Assam)
28. Regional Agricultural Research Station
Anakapalle (Andhra Pradesh)

ICAR Institutes

1. Vivekanand Parvatiya Krishi Anusandhanshala,
Almora (Uttaranchal)
2. Central Institute of Agricultural Engineering,
Bhopal (Madhya Pradesh)
3. Central Arid Zone Research Institute,
Jodhpur (Rajasthan)
4. Central Plantation Crops Research Institute,
Kasargod (Kerala)
5. Indian Institute of Sugarcane Research
Lucknow – 226 002 (U.P.)
6. Central Tuber Crops Research Institute (ICAR),
Thiruvananthapuram (Kerala)

New Centres

1. Central Agricultural University
Gangtok (Sikkim)
2. KVA & FSU
Mangalore (Karnataka)
3. Maharashtra Animal & Fishery Science University
Mumbai (Maharashtra)
4. Birsa Agricultural University
Ranchi (Chattisgarh)

LIST OF FIELD LEVEL SUCCESSFUL TECHNOLOGIES FROM AICRP on PHT CENTRES

No.	Centre	Technology	Status
1.	PDKV Akola	<ol style="list-style-type: none"> 1. PKV mini dal mill 2. PKV chilli seed extractor 3. PDKV fruit grader 4. PKV waste fired dryer 5. Evaporatively cooled structure for storage of perishables 6. Indigenous ethosorb technique for increasing green shelf life of Banana 7. Soya milk powder 8. Roselle calyces syrup for instant sherbat 	<p>Commercialized</p> <p>Commercialized</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p>
2.	VPKAS Almora	<ol style="list-style-type: none"> 1. Vivek thresher-cum-pearler 	Commercialized
3.	AMU Aligarh	<ol style="list-style-type: none"> 1. Extraction of plant based dye (henna & chicory waste) for textiles application 2. RTE / RTS Buffalo meat products (meat ball, sausage, patties, kabab, nuggets) 3. Pet food 	<p>Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p>
4.	RARS Anakapalle	<ol style="list-style-type: none"> 1. Process for Preparation of cane jaggery in crystal form 2. Preparation of cane jaggery cubes / blocks 3. Process for improvement of setting and quality of jaggery from immature, overaged, scale infested and drought affected cane juice 4. Double grating Anakapalle jaggery furnace for increased heat use efficiency 5. Crystal jaggery making unit 	<p>Technology transferred</p> <p>Commercialized</p> <p>Technology transferred to jaggery farmers/processors</p> <p>Technology transferred to jaggery farmers/processors</p> <p>Ready for commercialization</p>
5.	UAS Bangalore	<ol style="list-style-type: none"> 1. 2-in-1 Maize sheller-cum-Sunflower thresher 2. Arecanut dehusker 3. 3-in-1 mini Groundnut decorticator, Sunflower thresher and Maize sheller 4. Pedal operated coconut dehusker 	<p>Commercialized</p> <p>Commercialized</p> <p>Commercialized</p> <p>Commercialized</p>

		<ul style="list-style-type: none"> 5. Cardamom dryer 6. Safe storage of pulses using sand layer 7. White pepper making unit 8. Tamarind dehuller-cum-deseeder 9. Groundnut seed storage in coastal areas of Karnataka 10. Value added products from Jackfruit 	<ul style="list-style-type: none"> Ready for commercialization Ready for commercialization Commercialized Ready for commercialization Ready for commercialization Ready for commercialization
6.	ANGRAU Bapatla	<ul style="list-style-type: none"> 1. Turmeric polisher 2. Large scale drying of chilli by modified tobacco barns 3. Multi Purpose Poly House Solar Dryer for chilli drying (season) and nursery raising during (off-season) 	<ul style="list-style-type: none"> Ready for commercialization Ready for commercialization Ready for commercialization
7.	CIAE Bhopal	<ul style="list-style-type: none"> 1. Multi purpose grain mill 2. Pedal cum Power operated grain cleaner 3. CIAE Dhall mill 4. Groundnut decorticator, hand operated 5. Solar cabinet dryer for vegetables 6. Straw baler 7. Thermal disinfestation equipment for increased storage life of Pulses 8. Steam blancher for fresh vegetables 	<ul style="list-style-type: none"> Commercialized Commercialized Commercialized Commercialized Commercialized Ready for commercialization Ready for commercialization Ready for commercialization
8.	Ouat Bhubaneswar	<ul style="list-style-type: none"> 1. Cashew apple RTS 2. Cashew apple squash 3. Cashew apple jam/jelly 4. Osmo dehydrated Pineapple slices/rings and tidbits 5. Turmeric/Ginger washer 6. Dehumidified air dryer 7. Bael (Stone apple) slicer 8. Stone apple beverages 9. Mahua flower RTS 10. Mahua flower Jam 11. Mahua seed decorticator 12. Hand-operated Aloe Vera Gel Extractor 13. Stevia powder 14. Stevia tablets 15. Stevia extract 	<ul style="list-style-type: none"> Ready for commercialization Ready for commercialization Ready for commercialization Commercialized Ready for commercialization Ready for commercialization Ready for commercialization Ready for commercialization Ready for commercialization Ready for commercialization Ready for commercialization Ready for commercialization Ready for commercialization Ready for commercialization Ready for commercialization
9.	AAU Buralikson	<ul style="list-style-type: none"> 1. Low cost double pan furnace for jaggery making by small/ marginal farmers 	<ul style="list-style-type: none"> Ready for commercialization

		2. Herbal clarificants for sugarcane juice in jaggery making	Ready for commercialization
10.	TNAU Coimbatore	1. House hold insect trap 2. Four Roller Sugarcane Crusher 3. Bottling of Sugarcane juice 4. Household paddy parboiling unit 5. Mini Dahl Mill 6. Improved Farm level Turmeric boiler 7. Production of tomato paste 8. Fluidized bed dryer for Mushroom 9. Procee for idli batter fermentation 10. RTE drumstick product (canning, polypouch, retortable pouch)	Commercialized Commercialized Commercialized Commercialized Ready for commercialization Ready for commercialization Ready for commercialization Ready for commercialization
11.	TANUVAS Chennai	1. Electric Stunner for small animals	Ready for commercialization
12.	HAU Hisar	1. Aonla Pricking Machine	Ready for commercialization
13.	AAU Jorhat	1. Cauldron paddy parboiling technique 2. Process for utilization of paddy soaked for days under flood water 3. Value added products from ginger 4. Process for storage of ginger rhizomes in fresh form 5. RCC ring bin for paddy storage 6. Drying racks for efficient sun drying of paddy	Ready for commercialization Ready for commercialization Technology transferred to some SHGs Ready for commercialization Ready for commercialization Ready for commercialization
14.	JAU Junagadh	1. Feed Block Making Machine 2. Process for Essential Oil from Cumin 3. Process for enhanced Shelf Life of Kesar Mango 4. Cleaner- cum-Grader for Cumin 5. On-Farm Fruit Grader 6. Agriculture wastes-fired dryer for Red Chillies	Technology transferred to some NGOs and Farmers Ready for commercialization Ready for commercialization Technology transferred to some NGOs and Farmers Technology transferred to some NGOs and Farmers Technology transferred to some NGOs and Farmers

15.	CPCRI Kasargod	<ol style="list-style-type: none"> 1. Development of Shell fired Copra Dryer 2. Tender coconut punch and Cutter 3. Process for production of coconut chips 4. Production of snow ball tender nut 5. Design of solar cum electrical dryer with biofuel as third source of energy 6. Solar tunnel dryer 7. Process for virgin coconut oil 	<p>Technology transferred to farmer-cum-processors Ready for commercialization</p> <p>Commercialized</p> <p>Commercialized</p> <p>Technology transferred to Kerala Agro Industries Corp.</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p>
16.	IIT Kharagpur	<ol style="list-style-type: none"> 1. Grain puffing machine 2. Bamboo Cement Bin (for paddy storage) 3. Recirculatory tray dryer 4. Dehydrated vegetables 5. Ripe Bael drink and Unripe mango drink 6. Village level milk sterilizer 7. Production of snack products from kodo millet 8. Production of quicker cooking parboiled rice 9. Production of quicker cooking rice by simultaneous parboiling and drying of paddy 10. Betel leaf oil extractor 	<p>Commercialized Commercialized</p> <p>Commercialized Commercialized Commercialized</p> <p>Ready for commercialization Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p>
17.	RS&JRS Kolhapur	<ol style="list-style-type: none"> 1. Liquid Jaggery Production Process 2. Modified Electronic / Digital Thermometer to indicate the striking point temperature 3. Churner for defrothing during jaggery making 4. Modified Hardness tester for solid jaggery 5. Cane Juice Boiling Pan 6. Sugarcane Juice Filtration System 7. Sugarcane Juice collection and settling tank 8. Boiling Pan Tipping Mechanism 9. Okra plant stalk powder for clarification 	<p>Technology transferred to farmer-cum-processors Technology transferred to farmer-cum-processors</p> <p>Technology transferred to farmer-cum-processors Technology transferred to farmer-cum-processors Technology transferred to farmer-cum-processors</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p>
	WBUA&FS Kolkata	<ol style="list-style-type: none"> 1. Ready-To-Eat extruded fishery products 	<p>Ready for commercialization</p>

		<ol style="list-style-type: none"> 2. Process for extraction of flavour from shrimp waste 3. Fish Soup with Shrimp Flavour 4. Vegetable Soup with Shrimp Flavour 	<p>Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p>
18.	IISR Lucknow	<ol style="list-style-type: none"> 1. Jaggery cubes moulding frame 2. Drying-cum-storage bin for jaggery 3. IISR Two Pan Furnace with forced draft system 4. Improved triple pan furnace 	<p>Ready for commercialization</p> <p>Commercialized</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p>
19.	PAU Ludhiana	<ol style="list-style-type: none"> 1. Single Drum Rotary Screen Grain Pre-cleaner 2. Farm level fruit and vegetable washing machine 3. Turmeric washing and polishing machine 4. Electric-cum-Battery Heated Uncapping knife for honey 5. Trolley Drier for grains and vegetables 	<p>Commercialized</p> <p>Commercialized</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p>
20.	RAU Pusa	<ol style="list-style-type: none"> 1. Readymade <i>chultha</i> with grain puffing machine 	<p>Ready for commercialization</p>
21.	GBPUAT Pantnagar	<ol style="list-style-type: none"> 1. Electronic alarm for striking point of jaggery 2. Pantnagar Mini Dhal Mill 3. Hand operated potato peeler 4. Plant based grain protectant 	<p>Ready for commercialization</p> <p>Commercialized</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p>
22.	UAS Raichur	<ol style="list-style-type: none"> 1. Value added product (fish pickle) using low value fresh water fishes (Tilapia sp.) 2. Value added product (Fish sausage) by using low value Marine and Fresh water fish 3. Value added product (Fish cake) by using low value Marine fish 4. Value added product (fish balls) using low value marine fish (Squilla) 	<p>Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p> <p>Ready for commercialization</p>
23.	IGKV Raipur	<ol style="list-style-type: none"> 1. Process for Mango Powder, Mango Leather and Mango Toffee from different cultivars of Mango 	<p>Ready for commercialization</p>

		2. Whey-based Mango herbal beverages	Ready for commercialization
24.	YSPUH&F Solan	1. Technology for extraction of kernel oil from apricot stones/seeds	Commercialized
25.	SKUAST Srinagar	1. Cloud stable Cherry squash 2. Plum appetizer 3. Cherry candy	Technology transferred Technology transferred Technology transferred
26.	KAU Tavanur	1. Curing of Vanilla for higher vanillin content	Ready for commercialization
26.	CTCRI Trivandrum	1. Hand operated cassava chipping machine 2. Cassava rasper 3. Motorised chipping machine 4. Peeling knife 5. Pedal operated cassava chipping machine 6. Feed granulator	Commercialized Commercialized Technology transferred to entrepreneurs Technology transferred to entrepreneurs Ready for commercialization Ready for commercialization
27.	MPUAT Udaipur	1. Maize dehusker sheller 2. Garlic bulb breaker 3. Process technology for Garlic flakes & powder 4. Ginger and Turmeric Polisher 5. Technology for ginger and turmeric processing 6. Peeler cum polisher for Ginger and Turmeric 7. Solar heat treatment machine 8. Garlic peeling machine 9. Garlic clove flaking machine 10. Process for Maize-based Rab and Rabdi	Commercialized Commercialized Commercialized Ready for commercialization Technology transferred to farmer-cum-processors Commercialized Commercialized Technology transferred to farmer-cum-processors Commercialized Ready for commercialization

In addition to these, **Agro Processing Centres (APC)** are being established and monitored successfully by several AICRP on PHT centres, viz. PDKV Akola, VPKAS Almora, UAS Bangalore, ANGRAU Bapatla, CIAE Bhopal, OUAT Bhubaneswar, TNAU Coimbatore, AAU Jorhat, JAU Junagadh, PAU Ludhiana, MPUAT Udaipur, KAU Tavanur and GBPUA&T Pantnagar.

**A GLIMPSE OF TECHNOLOGIES DEVELOPED
UNDER AICRP ON PHT
DURING 2009 - 2010**

Crop produce based PHT

1. Pilot Plant for tender wheat shoot powder (1 kg powder/day), with multi-tier rack growing system - Akola centre
2. Continuous hot air puffing system for RTE snacks from rice mill and pulse mill byproducts (Final test pending) - Akola centre
3. Small capacity animal feed plant (100 kg/day) utilizing dal mill byproducts - Akola centre
4. Process optimization for production of spray dried soymilk powder - Akola centre
5. Kitchen purpose zero energy system to store assorted vegetables for a whole week.
6. Pricking machine for petha preparation (Aligarh Centre + Hisar Centre)
7. Dehuller for barnyard millet (5 hp, 45 - 50 kg/h) - Almora centre
8. Pedal operated winnower-cleaner-grader for millets, also suitable for wheat, paddy, lentil and soybean (250 - 300 kg/h) - Almora centre
9. Technique for control of stored grain insect in milled rice and milled piles (lab scale) - Bangalore centre
10. Utilization of spent charge from distillation of patchouli oil in manufacture of agarbatti - Bangalore centre
11. Tubular aeration system for improved on farm storage of potato - Bangalore centre
12. Manually operated *Mahua* seed decorticator - Bhubaneswar centre
13. Pineapple peeling-cum-coring device - Bhubaneswar centre
14. Small scale sunflower oil dewaxing system - Bhubaneswar centre
15. Pulse mill plant of 0.5 t/h capacity (75 - 78% recovery) based on the design of CIAE mini dal mill - Bhopal centre
16. Water jet system for peeling safe musli roots - Bhopal centre
17. Device for stripping Senna leaves (a thorny medicinal shrub) - Bhopal centre
18. Pearles for minor millets (foxtail millet, little millet, common millet) - Coimbatore centre
19. Mango fruit stone remover (1150 kg/h, 98% pulping efficiency) - Coimbatore centre
20. Complete process protocol for probiotic fruit juice (apple) - Coimbatore centre
21. Groundnut kernel testa remover (40 kg/h, 66.68% efficiency) - Jabalpur centre
22. Safe and low cost *holi* powder from tapioca - Jorhat centre
23. Biocontrol of crown rot of banana fruits - Jorhat centre
24. RTS beverage from Jamun and Banana - Jorhat centre
25. Candy from Khasi mandarin peel - Jorhat centre
26. Optimization of boiling pan size for jaggery making - Kolhapur centre
27. Standardization of anti caking agent to make jaggery powder free flowing - Kolhapur centre
28. Mechanical cane juice filtration unit, Boiling juice churning device, Sugarcane peeler, Small cane crushing unit - Lucknow centre

29. Full Mechanized honey filtration unit (50 kg capacity) - Ludhiana centre
30. Alternative to use of hooks (*kundi*) in handling grain bags – Ludhiana centre (Modified hook) + Bhubaneswar centre (Modified bag) + Udaipur centre (Modified bag)
31. Low calorie ice cream (using stevia powder) for diabetic patients - Pantnagar centre
32. Hand operated bitter apricot decorticator (5 kg/h, 87% efficiency) - Pantnagar centre
Apricot stone grader - Pantnagar centre
33. Cocoa based jaggery nuggets - Pantnagar centre
34. Dried apricot grader (200-250 kg/h, 92.5 - 81.4% efficiency) - Srinagar centre
35. Process and pilot plant for vanilla oleoresin - Tavanur centre
36. Black pepper decorticator (0.5 hp, 91.8% efficiency) - Tavanur centre
37. Shelf stable dehydrated quick cooking cassava tubers and amorphophallus tubers - Trivandrum centre
38. Industrial cassava rasper for starch extraction - Trivandrum centre
39. Control of Pulse beetle through custard apple seed extract (93.33% mortality) - Udaipur centre
40. Garlic peel remover for dehydrated flakes (Rs.17000, 50 kg/h) - Udaipur centre
41. Garlic clove grader (Rs.35000, 10 kg/h) - Udaipur centre
42. Mahua whine and Mahua RTS (from dried flowers) - Udaipur centre
43. Continuous grain pearler-polisher for pigeon pea milling, wheat and maize pearling and coriander deawning / debearding (75 kg/h, Rs 40000) - Udaipur centre

Livestock produce based PHT

1. Soy protein isolate and pectin incorporated buffalo meat sausage (Aligarh Centre)
2. Pet food based on buffalo slaughterhouse offals containing 'low fat high protein' (heart, liver, udder, lungs and tongue) - Aligarh centre
3. Pet food based on pig and poultry slaughter wastes - Chennai centre
4. Chicken based and beef based extruded food products - Chennai centre
5. Scalding tank for poultry - Chennai centre
6. Preparation of bile concentrate (following slaughter of buffalo) - Mumbai centre
7. Process for production of shrimp papad and fish papad - Kolkata centre
8. Fish fingers and smoked fish using low value marine fish - Raichur centre
9. Fish deboner machine (45 - 65 kg/h, Rs.60000) - Raichur centre
10. Technology for micro-encapsulation of fish oil as spray dried powder - Raichur centre
11. Fish sausage in natural casing - Mangalore (New centre)

And also the development of following prototypes are on the verge of completion :

- Onion seed extractor (Final Test pending) - Akola centre
- Hand operated large cardamom polisher (Final Test pending) – Gangtok centre
- Continuous carrot washer (Final Test pending) - Hisar
- Apricot kernel separator (Final Test pending) - Pantnagar centre
- Manual and mechanical sausage stuffer (Final Test pending) - Chennai centre

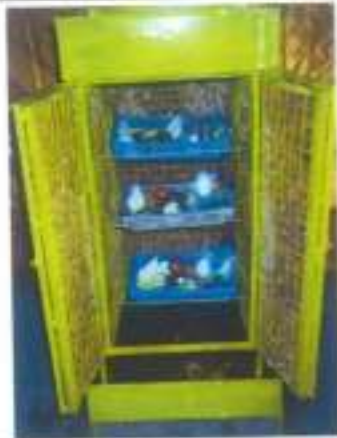
A GLIMPSE OF POST HARVEST TECHNOLOGIES : 2009 - 2010



PREPARATION OF SPRAY DRIED SOYMILK POWDER
(Akola centre)



CONTINUOUS HOT AIR PUFFING SYSTEM FOR RTE SNACKS FROM RICE MILL AND PULSE MILL BYPRODUCTS
(Akola centre)



ZERO ENERGY SYSTEM (ZES) FOR KEEPING VEGETABLES FOR A FAMILY UP TO 7 DAYS
(Akola centre)



PETHA PRICKING MACHINE
(Aligarh centre)



AGARBATTIS MANUFACTURED USING PATCHOULI SPENT CHARGE POWDER (10 %)
(Bangalore centre)



IMPROVED ON-FARM POTATO STORAGE SYSTEM WITH TUBULAR AERATION
(Bangalore centre)



DAL MILL PLANT (0.5 t/h) BASED ON CIAE MINI MILL DESIGN
(Bhopal centre)



PEELING OF SAFED MUSLI BY WATER JET
(Bhopal centre)



SENNA LEAF STRIPPER
(Bhopal centre)



GLAZED MAHUA FLOWER
(Bhubaneswar centre)



PINE APPLE PEELER CUM SLICER
(Bhubaneswar centre)



MANGO STONE REMOVER
(Coimbatore centre)



HONEY HEATING-CUM-FILTRATION SYSTEM
(Ludhiana centre)



HOLI POWDER FROM TAPIOCA STARCH
(Jorhat centre)



PLUM FRUITS AFTER REMOVAL OF BLOOM BY LYE TREATMENT
(Solan centre)



GARLIC GRADER
(Udaipur centre)



DRY GARLIC PEEL REMOVER
(Udaipur centre)



**PECTIN INCORPORATED
BUFFALO MEAT SAUSAGE**
(Aligarh centre)



**PET FOOD IN STICK FORM FROM
BUFFALO OFFAL (UDDER)**
(Aligarh centre)



**35% BUFFALO MEAT INCORPORATED
BISCUITS**
(Aligarh centre)









EXTRUDED CHICKEN MEAT PRODUCT
(Chennai centre)



BUFFALO BILE CONCENTRATE
(Mumbai centre)



**RTE FISH SAUSAGE PREPARED USING
NATURAL CASING**
(Mangalore centre)

 <div data-bbox="277 524 533 584" style="border: 1px solid black; padding: 2px;"> <p>INORGANIC JAGGERY (100% RDF NPK fertilizer)</p> </div> <div data-bbox="592 524 836 584" style="border: 1px solid black; padding: 2px;"> <p>ORGANIC JAGGERY (FYM @ 25% ha + Jeevamith)</p> </div>	
<p align="center">COLOUR OF INORGANIC AND ORGANIC JAGGERY (Anakapalle centre)</p>	<p align="center">SOLAR DRYER FOR JAGGERY (Lucknow centre)</p>
	
<p align="center">DRYING OF JAGGERY IN POLYHOUSE (Anakapalle centre)</p>	<p align="center">OPTIMIZATION OF JUICE BOILING PAN (Kolhapur centre)</p>
	
<p align="center">HOUSE HOLD CANE CRUSHING UNIT (Lucknow centre)</p>	<p align="center">JAGGERY-COCOA NUGGETS (Pantnagar Centre)</p>

PROGRESS REPORT OF THE CENTRES (2009 - 2010)

PDKV, AKOLA

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre (APC), training and demonstration of technologies

Investigators: P.H. Bakane / M. M. Dange and J. D. Patel

Objectives:

1. To establish one new Agro-processing centre on cereals and pulses
2. Monitoring performance of Agro Processing Centre
3. Demonstrations and training (6 no. per year)

Progress:

Project proposal of was prepared for the Farmer's Cooperative Society viz. Krishi Vikas Shetkari Audhogik Sahakari Sasntha, Jamthi (Hatgaon) Tq. Murtizapur Distt Akola (Maharashtra) for establishment of Agro Processing Centre. About 4500 farmers from 155 villages of two districts are the members of the society. Total land holding of the group is about 40,000 ha. Green gram, black gram, pigeon pea, sunflower, safflower and soybean are the major crops grown. Depending on the processing activity the machines installed in the APC are PKV mini dal mills, Shellers, Shevai machines and weighing balance. Demonstrations and Trainings for farmers and entrepreneurs were conducted. Demonstrations of shevai making were organized for village women.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available in the state

Investigators: V. B. Kalmegh and S.S. Dange / I.L. Pardeshi

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

Information was collected on proven post harvest technologies developed by R&D institutions and private industries in Maharashtra State. Seven technologies developed by the University and 49 reliable technologies developed by reputed private firms and available commercially were compiled and submitted in prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Maharashtra state

Investigators: V. B. Kalmegh and S.S. Dange / I.L. Pardeshi

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

An intensive survey of agro-processing units on cottage/ small scale level situated in production was done. The units selected were economically successful, inspiring, locally employment generative, low capital investment, expanded gradually resulting in total change of economical scenario of the family. Information was collected and 10 numbers of success stories were compiled. The different fields of processing were - Dal milling, Amla processing, Fruit product processing, Spices-food processing, Ber and pickle processing, Milk based chocolates manufacturing, Organic farm produce

processing, Cashew nut processing, Organic wheat grass processing, and Cold chain packaging for fresh fruit export.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: S.S. Dange, M. M. Dange and J. D. Patel

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio-economic factors that influence the adoption of post harvest technology.

Progress:

A survey of entrepreneurs having PKV mini dal mills was conducted in Vidarbha region of Maharashtra and more than 200 dal mills were found in Vidarbha region. From amongst them, a sample of 20 entrepreneurs with established PKV mini dal mills were randomly selected for the study. Till date, data for 17 entrepreneurs and 03 Agro processing centres have been collected. The primary data on various socio economic aspects, input-output of post harvest technologies and its impact on increase in income, employment, food and nutritional security, micro-environment, sustainability and market related information have been collected. The impact of the selected post harvest technologies generated and transferred under AICRP on PHT is also assessed at entrepreneur level on various dimensions such as space utilization, capacity utilization and human resource utilization. It is observed that the entrepreneurs are satisfied with the these technologies.

The centre has submitted Schedule 1 (to be filled by beneficiaries) for two technologies developed under AICRP on PHT.

INVESTIGATION NO. 5

Project Title: Monitoring of technologies already released by Akola Centre : Integrated PKV mini dal mill

Investigators: I.L. Pardeshi, P.A. Borkar and V. B. Kalmegh

Objectives:

1. Development and testing of Integrated PKV Mini Dal Mill
2. Popularization of developed Integrated PKV Mini Dal Mill

Progress:

Integrated PKV Mini Dal Mill was developed comprising of dal milling unit, splitter and sheller and operated with a 2 HP single phase prime mover. It is useful for milling of arhar, mung, udad, chickpea and cleaning of blackened jowar, wheat and raintouched mung. The integrated Mini Dal Mill is being popularized and accepted by the users owing to various additional features and versatility of the unit.

INVESTIGATION NO. 6

Project Title: Optimization of process parameters (feed rate, inlet and outlet drying air temp, final mc) for development of soymilk powder

Investigators: I.L. Pardeshi and V.B. Kalmegh

Objectives:

1. To optimize of process parameters for preparation of spray dried soymilk powder

Progress:

The soaking of soybeans in water for 12 h at normal temperature (± 28 °C) and heating of slurry prepared from wet ground paste for 20 min could yield white coloured

soymilk from soybean variety TAMS 38. The spray drying of the same could give soymilk powder at optimized process conditions of 350 to 375 g/h feed rate and 178 to 182 °C inlet drying air temperature. The other process parameters, such as aspiration rate (at vacuum of -80 mm WC) and outlet air temperature (100 °C), were kept constant. The response parameters, viz. final moisture content, sensory colour score and percent reconstitution, were satisfactory. The process for preparation spray dried soymilk powder has been established.

INVESTIGATION NO. 7

Project Title: Development of pilot plant for tender wheat shoot powder

Investigators: I.L. Pardeshi and V.B. Kalmegh

Objectives:

1. Development of pilot plant for tender wheat shoot powder as wheat nutraceutical
2. Characterization of raw material and of final product developed

Progress:

A multi tier rack growing system for tender wheat shoot cultivation and a pilot plant for tender wheat shoot powder were developed having 1 kg powder per day capacity. The unit is operated with 1.5 kW electric load. It is estimated that this plant can result a profit of at least Rs.1000/- per day and will be a successful, rural based, women-managed cottage level unit.

INVESTIGATION NO. 8

Project Title: Development of continuous hot air puffing system (5 to 10 kg/h capacity) for RTE snacks from rice mill and pulse mill byproducts

Investigators: I.L. Pardeshi and V.B. Kalmegh

Objectives:

1. Development of continuous hot air puffing system
2. Development of Ready- to-eat snacks, from rice mill and dal mill by-products, suitable for human consumption

Progress:

A continuous hot air puffing system to prepare oil free and durable puffed RTE snack foods utilizing rice-mill and dal mill by-products has been developed. Cold extrudate prepared in rectangular shape were puffed using this system. The continuous operation with hot air recirculation of the system is the unique feature resulting into five-fold increase in capacity and 60 % reduction of heating load over conventionally existing batch type puffing system. After intensive trials, requisite modification will be incorporated by December-2010. It is operated using 1 hp blower and 8 kW heaters.

INVESTIGATION NO. 9

Project Title: Development of small capacity (100 kg/day) animal feed plant using dal mill waste

Investigators: V.B. Kalmegh/ M.M. Dange and S.S. Dange/J.D. Patel

Objectives:

1. To develop a small capacity (100kg/day) animal feed mechanisms for compacting dal mill waste into animal feed briquettes
2. Testing of the machine

Progress:

PKV mini dal mill gives the recovery of 72 to 75% , and the remaining 25 to 28 % goes as byproduct/waste (broken + powder + husk). This byproduct, containing nearly 18-20% of proteins, was used for making briquettes for animal feed purpose. For preparing briquettes, a small capacity (100kg/day) machine has been developed. The machine consists of hopper, mixing chamber, screw conveyor, compaction chamber, reducer, collector and motor. Testing of the machine for making briquettes is under progress. The byproduct obtained from PKV mini dal mill is coarse grinded, then

conditioned with water and thoroughly mixed in a container. This mixture is then feed to the prototype developed for preparing briquettes.

INVESTIGATION NO. 10

Project Title: Minimal processing of vegetables (spinach, cabbage, cauliflower, cluster bean, brinjal, cucumber, tomato, sweet pepper, okra, tinda) to complement the weekly food schedule at household level

Investigators: M.N. Ingole and I. L. Pardeshi

Objectives:

1. To study the effect of different pretreatments, packaging materials and storage conditions on storability of minimally processed vegetables
2. To formulate a schedule for the use of vegetables in a week at house level

Progress:

A kitchen purpose zero energy system (ZES) is developed to complement weekly schedule for keeping vegetables in lieu of using refrigerator for this purpose. In case of non-treated unpacked samples kept in ZES, brinjal, tinda and cucumber can be used up to 6th day and tomato up to 7th day. For untreated samples packed in 200 gauge polypropylene bags and kept in ZES, spinach can be used upto 3rd day, okra, cabbage and cauliflower up to 5th day; clusterbean up to 6th day and sweet pepper up to 7th day.

INVESTIGATION NO. 11

Project Title: Development of seed extractor for onion

Investigators: V.B. Kalmegh and I.L. Pardeshi

Objectives:

1. To develop Onion seed extractor
2. Performance evaluation of the prototype

Progress:

A prototype onion seed extractor has been developed. Its overall dimensions are 1375x1000x1625 mm. The machine consists of hopper, beater-drum, sieve, discharge shoot, blower, trash separator, power transmission unit, frame and a 1 hp single phase motor. Laboratory trials were conducted and necessary modifications are incorporated. The unit is ready for field testing during the coming season (May/June 2011).

AMU, ALIGARH

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre (APC), training and demonstration of technologies

Investigators:

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings (6 no. per year)

Progress:

The APC of Mumtaz Self Help Group continued to engage in processing/grinding of spices (coriander, turmeric, red chilly and garam masala) and besan. The group is functioning well and successfully marketing its products. Total income of the centre during 2008-09 Rs. 82,820/-. On the occasion of Women's Day (08th March 2010), the total sale of the centre was Rs. 24,000/- while the share of spices was Rs. 2000/-

The centre has identified three beneficiaries under the Central Sector Scheme (Component-1) for establishment of Agro Processing Centres and has submitted Bilateral MOU with project profiles.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available in the state

Investigators:

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information in prescribed format on 8 technologies, viz. 1. Pet Food, 2. Buffalo meat fresh sausage, 3. Buffalo meat patties, nugget, meat ball and kabab (Offal Incorporated), 4. Curing and smoking of buffalo meat, 5. Date jam, 6. Jaggery based caramelized toffees, 7. Honey based carrot candies, 8. Low Cost Emulsion Applicator, 9. Extraction of natural dye.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Uttar Pradesh state

Investigators:

Objectives:

1. To survey the status of meat industries of the state
2. To compile success stories of meat industries in the state

Progress:

Status of meat industry in Uttar Pradesh was assessed. The state is the largest meat exporter in the country. Altogether 53 Buffalo Meat Processing (Frozen) Units in Uttar Pradesh were identified along with their frozen capacity and slaughtering capacity. Out of these, 49 units are situated in western UP around the Aligarh district. In the rest of UP only four units are running (in Unnao/Barabanki). The frozen capacity is 560 MT/day from four meat units under operation in Aligarh district.

Among the meat processing industries, M/S Hind Agro Industries has set up an integrated meat processing plant/abattoir, consisting of slaughtering, freezing facilities and rendering plant for processing of offals/waste. Hind Agro Industries Limited is the first company in India to have Asia's one of the most modern abattoir-cum-meat processing plants at Aligarh. It is a joint venture of Hind Industries Limited, Govt. of UP and assisted by Govt. of India. This plant is approved by APEDA for export of meat and meat products.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators:

Objectives:

- To estimate the economic viability of post harvest technologies developed under AICRP on PHT
- To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
- To assess the possible impact on household food and nutritional security
- To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The centre is yet to submit the Schedule 1 (to be filled by beneficiaries) and Questionnaire 2 (to be filled by PI / RE) for the technologies developed by the centre.

INVESTIGATION NO. 5

Project Title: Development of prototype of fluidized bed dryer for selected vegetables (cauliflower and cabbage).

Investigators: A.K. Srivastava, Mohammad Ali Khan, Dr. Wazid Ali Khan

Objectives:

- To study drying behavior of selected vegetables, in suitable forms, in laboratory model fluidized bed dryer.
- To design, manufacture, test and modify (as required) a prototype of fluidized bed dryer.
- To study the quality characteristics of fluidized bed dried products and to compare with the quality of such products dried by other methods viz., sun drying, solar drying, tray drying and belt drying.
- To study techno-economics and energetics of prototype fluidized bed dryer.

Progress:

Drying characteristics of cauliflower pieces in laboratory model fluidized bed dryer were evaluated and compared with tray drying. At air temperature of 70 °C, reasonably low moisture content of 5% (db) of cauliflower could be obtained in 63 min of drying as compared to a final moisture content of 7.8 % (db) in 210 min of drying in the tray dryer. RH exhaust air after 20 min of drying was in a low range of 31.9 - 12.2 %. A prototype of fluidized bed dryer for drying of fruit and vegetables was, therefore, fabricated to improve HUF by recirculation. Necessary modification is being carried out following initial trials.

INVESTIGATION NO. 6

Project Title: Extraction of natural dye from biomass (Henna and Chicory waste) and its application on textiles.

Investigators: Mohammad Ali Khan, P. K. Srivastava and M. Siddiqui

Objectives:

1. To extract dye from powdered natural vegetable raw material in aqueous system.
2. To dye samples at different concentration of extracted dyes and mordents.
3. To standardize the dyeing recipe for textile.
4. To analyze the wash, light and rub (dry and wet) fastness of the dyed samples.
5. To measure the colour values of dyed samples in terms of their $L^*a^*b^*$ and $L^*c^*h^*$ values.
6. To create the data bank of dye recipe. To evaluate the economic feasibility of extraction and dyeing from biomass.
7. To demonstrate the technology to the entrepreneur/industry

Progress:

Trials were taken for extracting natural dye from agricultural wastes, viz. Chicory and Henna, for dyeing of wool and cotton with different mordents and extracted dyes. The wash fastness and the rub (dry and wet) fastness of most samples of wool were found to be very good. The dyeability henna dye on jute gave better results under post mordanting. Ninety-five shades on jute and thirty shades on cotton were developed with different percentages of dyes and mordants. All the developed shades were uniform. Darker shades were produced when acidic medium was used or by dyeing the iron mordanted samples. Very light colours were produced by using reetha as a mordant.

INVESTIGATION NO. 7

Project Title: Mechanization of petha industry and technological interventions for process / product improvement

Investigators: Wazid Ali Khan, A. K. Srivastava, Md Ali Khan and Saghir Ahmad

Objectives:

1. To study the present status of the Petha industry and identification of technological gaps
2. To conduct time and motion study of existing processes of Petha manufacturing in Aligarh city
3. To evaluate various physico-chemical, microbial, textural and organoleptic qualities and shelf life of Petha in various packaging systems in under ambient conditions
4. To study the economics of Petha manufacturing

5. To standardize the processes and recipe of Petha manufacturing
6. Mechanization of unit operations involved in Petha manufacturing process

Progress:

Operations involved in preparing petha from ash gourd (viz. cutting, pricking, lime treatment, blanching, syruping, packing) are manual and labourious, with little attention is given to the hygiene, so the shelf life is also short. A mechanized pricking machine has been fabricated using stainless steel needles under technical guidance of Hisar centre and performance evaluation conducted. Shelf life of petha could be enhanced to 60 days compared to that of market petha of 40 days.

INVESTIGATION NO. 8

Project Title: Studies on effects of incorporation of edible offal and fat mimicking substances on quality and shelf life of selected ready to eat/serve buffalo meat products and their refrigerated storage

Investigators: Saghir Ahmad, P.K. Srivastava, Md Ali Khan, Wazid Ali Khan and Mahjabeen Siddiqui

Objectives:

Development of ready to eat/ready-to-serve meat products like kabab, patties nuggets, samosa, meat ball and sausage etc by incorporating edible offals and fat mimicking substances in lean meat.

Optimization of levels of offals/fat mimicking substances in lean meat.

Evaluation of the calories per gram of the developed low fat meat products and its comparison with conventional high fat meat product.

Quality evaluation of ready to eat/serve meat products developed by incorporating offals/fat mimicking substances in lean meat.

Studies on quality and shelf life of developed products under refrigerated condition using different packaging system and materials.

To study cost economics of offal/fat mimicking incorporated ready to eat/serve meat products

Progress:

Soy protein isolate could be incorporated up to 10% in buffalo meat product, viz. low fat emulsion sausage (prepared with 30% edible offals, up to 5% starch, alginate and pectin 2%). It was found that when fat mimicking substances (starch) was incorporated in the lean meat at the levels of 1 to 5%, it improved texture and reduced the fat level in the meat products. Aluminum coated laminated film was found better packaging material. Based on study of physico-chemical, microbiological and sensory parameters of sausage, the product was under safe limit up to 25 days of storage at 0°C temperature.

INVESTIGATION NO. 9

Project Title: Development and quality evaluation of meat offal and vegetable waste incorporated pet foods in extruded form

Investigators: Md Ali Khan, A.K. Srivastava, Wazid Ali Khan, M. Siddique

Objectives:

To develop pet food by incorporating buffalo meat byproducts and chicken byproducts along with residues/byproducts of cereals, pulses, oil seeds and fruits/vegetables using extrusion technology.

To study the physico-chemical and microbiological characteristics of fresh, control and offal incorporated pet food.

To study the sensory response of pet food on dog, cat and captive animals.

To design and develop a suitable equipment for continuous formation of pet foods

To study the economics of pet food and human food production

Progress:

Some important and cheap slaughterhouse offals like heart, liver, udder, lungs and tongue were identified for development of pet food. Low fat content but high protein content makes these offals suitable as a treat for dogs that do not tolerate fat products. Following pretreatment were adopted prior to drying in order to improve product quality, storage stability and process efficiency : 1. Blanching, 2. Wet curing, 3. Dry curing and 4. Control. It was then followed by drying at 60°C temperature for 24 h. Moisture content and water activity of dehydrated samples were 10.38% and 0.544 respectively. It was observed that the blanching treatment gave better result in appearance in comparison to other treatments and control. After 12 months of storage study of heart in sliced form was good condition and physico-chemical properties like pH, protein, fat, ash and water activity were 6.65, 72.86%, 6.51%, 3.92% and 0.436 respectively.

INVESTIGATION NO. 10

Project Title: Development and quality evaluation of buffalo meat incorporated food products

Investigators: M. Siddiqui, Md Ali Khan, Saghir Ahmad Khan, A.K Srivastava, and Dr Wajid Ali Khan

Objectives:

1. Development and evaluation of microbiological and other relevant quality characteristics
2. of buffalo meat powder incorporated functional food in the form of extrusion-cooked
3. products and biscuits.
4. Evaluation and demonstration of functional properties of developed functional foods in
5. comparison to direct use of buffalo meat food products.
6. Study of the economics of manufacturing buffalo meat based functional food at cottage level.
7. Development of technology profile (project profile) of developed products to help interested entrepreneurs

Progress:

Several preliminary trials were conducted to optimize the level of incorporation of buffalo meat in biscuits. From 30%, 35%, 40% and 45% buffalo meat incorporated biscuits in the second stage, the final composition was selected at 35% buffalo meat on the basis of 3-point bend test through the textural analysis. The ingredients consisted of meat powder, milk powder, white flour, carrot juice, apple juice, cardamom, cinnamon, salt and oil. The process comprised grinding, mixing, kneading, moulding, baking at 230°C for 10 min, cooling and packing with heat sealed combination film.

Quality evaluation has been done in terms of physicochemical (pH, moisture content, fat content, protein content, TBA number), microbiological analysis (total plate count and yeast and mold count) and textural analysis. Buffalo meat is considered tasty and lean, as it contains lower saturated fat than beef and pork. Buffalo meat incorporated biscuit could serve as protein supplement.

INVESTIGATION NO. 11

Project Title: Utilization of by-products from buffalo meat industry

Investigators: Saghir Ahmad, M.A. Khan, A.K. Srivastava, Wazid Ali Khan, and Mahjabeen Siddique

Objectives:

- To study the existing practices of animal handling and slaughtering in rural areas
- To develop cost effective technologies for utilization of slaughterhouse by-product
- Shelf life study of edible by-product and primary processed product under different packaging material and storage conditions
- Development of value added products from offals

Progress: Not reported.

VPKAS, ALMORA

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre (APC), training and demonstration of technologies

Investigators: K. P Singh, M. L. Roy and Hukumraj Kharbikar

Objectives:

1. Establishment of one APC in Almora district of N-W Himalayan region for generating income, employment and increasing agricultural productivity
2. Techno economic evaluation of the existing and proposed agro-processing centre.
3. Assessment of impact of APC on rural masses in nearby village's w.r.t. yield improvement, employment generation (direct and indirect) and income

Progress:

Following the successful functioning of APC Takula, three more APCs were established, in Champawat District under NAIP and Uttarakhand Govt. is also planning to establish APCs in each district of the State. Apart from APC Takula, two more APCs have been finalised under AICRP on PHT. A survey was conducted to select two more suitable entrepreneurs for establishing APCs in Kumaon hills. Two suitable entrepreneurs (one from village - Raulshera, district - Almora and other from village - Ganale Gangoli, district-Pithauragarh) have been selected by the committee formed by the Director of the Institute.

Total 30 demonstration of 10 units of millet thresher-cum-pearlers were given in the farmers' field. A seven days training (lectures and practical) on "Post harvest and farm implements for hills" for 17 selected artisans of Champawat district was also organised under Central Sector Scheme.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available in the state

Investigators: K. P Singh

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 3 technologies developed under AICRP on PHT in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Maharashtra state

Investigators: K. P Singh

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

A survey proforma was prepared for collecting the data from various processing units. Out of 31 total processing units 12 units (Table 2) were surveyed in which 7 were under private management, 2 of State government and 3 of Co-operative management. Nine units were more than 15 years old, 7 units of 7 - 15 years old and 1 units of less than 7 year old. Processing units are making processed products like Jam (apple and mixed fruits), squash (malta, lemon, litchi, mango and buransh), pickle (lemon, garlic, mango, chill and mixed), candy (amla and apple), ketchup (tomato and mixed) and chutney (apple, plum, papaya and tomato). Based on their production capacity the processing unites have been assigned in four scales viz., house hold scale (capacity \leq 10 MT), cottage scale (capacity = 10-50 MT), small scale (capacity = 50-100 MT) and large scale

(capacity = 100-200 MT). The strength of house hold and cottage scale units is availability of raw materials in local markets but they are facing the problem of marketing of their processed products. The availability of raw material (in local market) is big problem for small and large scale units, however they have good market network for their processed produces.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: K. P Singh

Objectives:

To estimate the economic viability of post harvest technologies developed under AICRP on PHT

To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product

To assess the possible impact on household food and nutritional security

To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

After survey and analysis of data it was inferred that due to intervention of millet thresher-cum-pearler the income of farmers has been increased. Cereal production of Uttaranchal state (in hilly region) suffices only for 50% of its food need. Millets, though not surplus, were generally utilised for animal feed in these areas due to unavailability of appropriate processing technologies. Significant impact was observed after introduction of this machine (at present about 400 machines are being used in Uttarakhand State). Now millets are being increasingly used for human consumption. Price of these grains has also been increased. Farmers are getting more prices for their millet produces.

The centre has submitted Schedule 1 (to be filled by the beneficiaries) for one technology developed by the centre.

INVESTIGATION NO. 5

Project Title: Adaptive trials on improved post harvest equipments suitable for N-W Himalayan region: Peanut decorticator, maize sheller, zero energy cool chamber, soy processing unit & millet huller

Investigators: K. P Singh

Objectives:

1. Feasibility testing of identified post harvest technologies/equipments and need based modification for suitability in N-W Himalayan region.
2. To demonstrate these technologies on large scale and assessing their impact on local population

Progress:

Demonstration and adoptive trials of zero energy cool chamber (IARI model), millet dehuller, paddy thresher, CIAE sola dryer, CIAE cleaner grade, CIAE hand maize sheller, CIAE cabinet dryer, CIAE serrated sickle, hand wheel hoe and Soya processing unit were conducted. Zero energy cool chambers were constructed at different 5 locations and feedbacks of farmers were recorded. In result of intensive demonstration and trials we received demand of post harvest equipments/ machineries ranging from about 20 units of Soya processing unit (Commercial) to 350 units of Vivek thresher.

Soya processing unit (cost Rs 2.7 lakh, commercially available from M/s Pristine Plant India Private Ltd, Faridabad, Mobile : 09873583710) was demonstrated to the hill farmers for making soya paneer and soya milk making. As a result of our demonstration

and popularization, from 2009 to till date, 20 Soy Processing units have been procured and owned by different entrepreneurs of Uttarakhand.

INVESTIGATION NO. 6

Project Title: Value addition of barnyard millet (VL-172) and its byproduct (hull)

Investigators: K. P Singh

Objectives:

1. To analyze important physico-chemical and engineering properties and sorption behaviour of barnyard millet grain and kernel.
2. To design and develop a dehulling machine for barnyard millet grain and optimize its operating parameters.
3. To optimize pre-treatment conditions and process parameters for dehulling of barnyard millet grain.
4. To formulate millet-wheat composite flour and study its physico-chemical characteristics.
5. To prepare bread from the developed composite flour and evaluate its quality.
6. To study the changes during accelerated storage of composite flour and evaluate its shelf life

Progress:

A 5 hp electric motor driven dehuller of 45-50 kg/h capacity was developed. The machine and process parameters of this dehuller were optimized using CCRD and RSM for maximizing efficiency and minimizing specific energy consumption and broken grains. The dehulling efficiency of $88.3 \pm 2.8\%$ having specific energy consumption of $0.078 \pm$ kWh kg⁻¹ grain and broken grain to the extent of $6.1 \pm 1.1\%$ were obtained with the optimized machine parameters (9 canvas strips and 3 mm over hanging width) and operational parameters (8.6 m/s peripheral speed; 5 passes and 8.4% db moisture content).

After applying pretreatment (i.e. 9 min steaming and 31 g/q mustard oil treatment), the actual dehulling efficiency, specific energy consumption and broken grain were $76.3 \pm 3.6\%$, 0.018 ± 0.004 kW h kg⁻¹ and $7.3 \pm 1.5\%$, respectively in single pass of dehulling.

Composite flour having barnyard, finger, proso millet and wheat 9.1, 10.1, 10.2 and 70.6%, respectively was utilized to prepare bread with significant increase in shelf life (26 days).

INVESTIGATION NO. 7

Project Title: Design, development and evaluation of pedal operated low cost light weight winnower-cum-cleaner for millets

Investigators: K. P Singh

Objectives:

1. To analyze important physical properties of selected millet like finger, proso and barnyard millet.
2. To design and develop a winnowing-cum-cleaning machine for millets

Progress:

A manually operated winnower-cleaner cum grader has been developed. The machine was fabricated using locally available materials. The winnowing/cleaning/grading capacity of the machine is 250 -300 kg/h. This machine is suitable for winnowing, cleaning and grading of wheat, paddy, lentil, soybean and millets.

RARS, ANAKAPALLE

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre (APC), training and demonstration of technologies

Investigators: P. Sreedevi and K.Veerabhadra Rao

Objectives:

1. To establish agro processing center on jaggery cubes / blocks, crystal and liquid jaggery in jaggery making area of Visakhapatnam district at farmer level
2. To procure, install and demonstrate the improved post harvest equipment (three / four roller improved horizontal crusher, improved three pan furnace, gur moulding frames of cubes / blocks of different sizes viz. 25,125 & 500g, crystal jaggery making unit), mechanical siever, mechanical / solar dryer, packaging machine, liquid jaggery bottling sterilization unit).
3. To impart training on operational skills and maintenance of different post harvest equipment to the jaggery farmers.
4. To provide technical guidance to rural entrepreneurs for mass multiplication of post harvest equipment installed at agro processing center.

Progress:

Potential jaggery villages of Visakhapatnam district were surveyed to identify farmer for establishment of APC at farmer's site. Under Component 1 of CSS project one Project proposal was made to establish Units for "Primary Processing Technology" on solid jaggery cubes and crystal jaggery in jaggery making areas of Visakhapatnam district at farmer level. One beneficiary (farmer) was selected from Veduruparthi village, Kasimkota mandal, Visakhapatnam district and signed bilateral MOU was submitted for approval for establishment of APC under Central Sector Scheme (Component-1).

Under Component 4 of CSS, month-wise training calendar was prepared for conducting training to farmers, Entrepreneurs and Scientists, submitted and awaited for the approval under Central Sector Scheme.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available in the state

Investigators: P. Sreedevi and K.Veerabhadra Rao

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on technology developed under AICRP on PHT in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Andhra Pradesh state

Investigators: P. Sreedevi and K.Veerabhadra Rao

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress: Not reported.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators:

Objectives:

5. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
6. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
7. To assess the possible impact on household food and nutritional security

8. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The centre has submitted the Schedule 1 (to be filled by beneficiaries) for 3 technologies and Questionnaire 2 (to be filled by PI / RE) for 4 technologies developed by the centre.

INVESTIGATION NO. 5

Project Title: Production of organic jaggery (from planting to processing)

Investigators: K. Veerabhadra Rao and P. Sreedevi

Objectives:

To study the effect of organic manures on yield and quality of jaggery in relation to those affected by inorganic fertilizers in sugarcane

Progress:

The study showed that cane and jaggery yields were lower in organic plots compared to those obtained in inorganic plots. However, application of FYM @25t/ha (in two splits) + liquid manuring of Jeevamruth thrice during the crop growth improved cane and jaggery yields considerably (74.8 and 6.2 t/ha respectively) over control (68.1 and 3.0 t/ha respectively).

The study conducted also showed that bright coloured jaggery was obtained from organic plots. But, total non-sugar and moisture contents were found to be higher, thereby making the organic jaggery soft compared to that of the inorganic jaggery.

Jaggery was prepared using different clarificants such as milk (@1ml/1lt), honey (@1ml/1lt) and a root extract locally known as Nannari (@1g / 1lt) along with lime. Highest jaggery recovery (13.5%) was recorded in the treatment where lime alone was used as clarificant.

Scum recovery percentage was higher in the treatment where milk was used as clarificant. The jaggery prepared using milk as clarificant from irrigated cane was bright in appearance. Percent of total nonsugars were recorded comparatively lesser in the jaggery samples prepared by using milk as clarificant over other clarificants.

All the samples prepared with different clarificants were kept for storage studies for quality assessment under progress.

INVESTIGATION NO. 6

Project Title: Physico-chemical parameters of solid jaggery during and after cold storage

Investigators: K. Veerabhadra Rao and P. Sreedevi

Objectives:

1. To study the bio-chemical changes of jaggery samples (blocks/cubes) kept for storage during and after cold storage

Progress:

Jaggery in cold storage brings benefit to farmers by making it available even in off-season. Jaggery blocks / cubes (1.0kg size) were packed with and without silica gel sachets in different packing materials (LDPE, double layer LDPE+Aluminium foil, double layer LDPE+Aluminium foil with vacuum and Hessian cloth). Bio-chemical changes were studied during and after cold storage in comparison with normal storage over a period of 5 months (June-November 2009) showed that samples kept with silica gel sachets suffered less changes under both storage systems. All the samples under normal storage were affected with microbial growth during October 2009 whereas such microbial incidence was not observed in any of the cold storage samples kept at 10-12 °C temp and 60-70 % RH.

Samples of cold storage were taken out during November 2009 and kept under ambient conditions (28-30 °C and 68-75 % RH) within the respective packing materials and also without the packing material. Analysis of the post cold storage samples revealed

reduction in sucrose and increase in reducing sugars and total non-sugars content. The biochemical changes were less in samples with silica gel sachets compared to those without silica gel sachets. All the samples turned dark, though there was no incidence of fungal growth over a period of 3 months (November 2009 to February 2010) and the samples also maintained their hardness.

INVESTIGATION NO. 7

Project Title: Quality (reducing sugar, non-reducing sugar, pH, colour and moisture) characterization of jaggery agglomerates (>3.0 mm size) obtained during granular jaggery making

Investigators: K. Veerabhadra Rao, P. Sreedevi

Objectives:

1. To study the quality characteristics of agglomerates (>3.0 mm crystals) (with or without heating & grinding) in comparison to that of powder (<3.0 mm crystals) formed during jaggery powder making

Progress:

During preparation of crystal jaggery, 80-85% is in the form of crystals (<3.0 mm) and the rest (15-20%) is in the form of agglomerates (>3.0 mm). Quality characteristics of crystals and agglomerates of small and big (3-5 mm and >5.0 mm) size were studied. The biochemical characteristics of the above sample were also studied after (1) grinding and (2) heating followed by grinding. Decrease in sucrose content and increase in reducing sugars and in percent of total nonsugar content were observed in the samples obtained from grinding and heating followed by grinding compared to the original samples. Agglomerates, obtained during crystal jaggery making, reduces the benefit to the farmers as it fetches lower grade rate. These can be powdered and sold.

INVESTIGATION NO. 8

Project Title: Design and development of batch type mechanical tray dryer and solar dryer (200 kg)

Investigators: P. Sreedevi and K.Veerabhadra Rao

Objectives:

1. Design and fabrication of 100kg capacity batch type mechanical tray dryer based on process parameter and 200 kg capacity Solar dryer (poly house) based on process parameter
2. Testing and evaluation of mechanical tray dryer to optimize the process parameters i.e., drying temperature, time, material thickness and air flow rate.
3. Techno- economic analysis of mechanical tray dryer and solar dryer (Poly house).

Progress:

Drying was carried out with 50 kg sample of crystal jaggery prepared from the cane variety 93A145 (early variety) for 6 hours per days i.e from 10.00 AM to 4.00 PM (February 2010). It took about 12 hours (two days) to reduce moisture level from 9.6 to 1.9% (db) in poly house solar dryer whereas in open yard it took 18 hours (about 3 days) to reduce moisture from 9.6 to 2.4. Maximum temperature noted was 32.0 °C and RH was 91%. Quality analysis of crystal jaggery before and after drying showed slight reduction in sucrose percent in open yard drying compared to poly house drying. The crystal jaggery needed to be immediately sealed in LDPE covers after drying in the poly house at the end of the day itself to prevent from absorbing ambient moisture. Bright colour was observed for the jaggery dried in poly house compared to open yard drying.

A batch type mechanical tray dryer of 100kg capacity was fabricated with accessories such as furnace, heat exchanger and blower. Insulation with asbestos material was made to the doors of drying chamber, inlet and outlet pipes to minimize heat loss during passage of hot air. Temperature indicator with automatic cut off after attaining desired temperature were installed for maintaining required temperature. Testing was carried out using bagasse and trash as fuel to generate heat energy. It took about 10 hours for drying of Crystal jaggery could be dried in 10 hours from 9.3 to 2.6 % moisture

content. Eight kg trash or bagasse was required to raise initial temperature of drying chamber to 10 °C in 10 min and thereafter 5min to rise up to 50 °C, which was maintained as the drying temperature. Total fuel required for drying is 60.0 kg and time saving was 37.5 % in comparison to open yard. However, it requires engaging a labour through out the drying process for feeding of fuel. The quantity of fuel required was also high. It was also observed that there was Change in colour of crystal jaggery was observed from light brown to dark brown, which may reduce consumer preference.

UAS, BANGALORE

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre (APC), training and demonstration of technologies

Investigators: V. Palanimuthu, S. Subramanya, R. Chandru, KB. Munishamna, B. Kalpana, and K.B. Suresha

Objectives:

- To oversee the functional performance of installed processing equipments in APCs
- To initiate and promote value addition activities by SHGs and assist them in developing market tie-ups for their products
- To organise training programmes for farming community
- To monitor the progress of APCs already established
- To establish new Agro-Processing Centres

Progress:

The progress of all the 17 APCs was monitored. Processing activities, especially cleaning, flour milling, dal milling and arecanut plate making were carried out in different APCs. Some maintenance work was also taken up in a couple of APCs. In Alur APC, the burr stones were replaced. In some APCs, there is a demand for a change in equipments to upgrade their processing capabilities. Most of the established APCs were running profitably. Consultation is going on with enterprising SHGs for the establishment of TWO New APCs. It is likely to take up in 2-3 months.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available in the state

Investigators: V. Palanimuthu, S. Subramanya, R. Chandru, KB. Munishamna, B. Kalpana, and K.B. Suresha

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 13 technologies developed by the centre under AICRP on PHT, on 29 technologies developed by SAU/R&D institutions and 15 commercially available technologies from reputed private firms, in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Karnataka state

Investigators: V. Palanimuthu, S. Subramanya, R. Chandru, K.B. Munishamna, B. Kalpana, and K.B. Suresha

Objectives:

3. To survey the status of agro-processing industries of the state
4. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Six success stories of agro-processing ventures in Karnataka are developed.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: V. Palanimuthu, S. Subramanya, R. Chandru, K.B. Munishamna, B. Kalpana, and K.B. Suresha

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The centre is yet to submit the Schedule 1 (to be filled by beneficiaries) and Questionnaire 2 (to be filled by PI / RE) for the technologies developed by the centre. Data collection is still in progress.

INVESTIGATION NO. 5

Project Title: Development of process and equipment for value added nutri-rich food products from small millets (little millet, foxtail millet, proso millet)

Investigators: R. Chandru, B. Kalpana, KB. Munishamna, S. Subramanya, and V. Palanimuthu

Objectives:

1. Hydrothermal pretreatment studies of selected small millets for superior quality parboiled millet rice grains
2. Evaluation of cooking and nutritional qualities of raw and parboiled millet grains
3. Development of extruded, puffed, malted and baked value added products from selected small millets and their packaging
4. Popularization of successful value added products

Progress:

Small millets contain 21-29 % of husk, which has to be removed to make use of the grain for human consumption. In the present study small millets namely, barnyard, foxtail, kodo & proso millets were first dehusked using a burr mill and small millet rice grains were separated from whole grains, washed and dried prior to analysis.

Nutritional analysis of raw millet rice grains showed that foxtail and proso millets contained higher levels of protein i.e., 12.14 and 10.48%, respectively when compared to barnyard and kodo millet rice grains. Barnyard millet rice grain had highest level of ash (4.35%). Crude fibre and fat content were highest in foxtail millet. On dry weight basis, available energy varied from 390 to 401 kcal from 100 g of small millet rice grains.

Different small millet rice grains were utilized in the preparation of bakery products like coconut biscuits, doughnuts, rusk and muruku by incorporating millet flours at different levels to maida and/or rice flour. By incorporating small millet flours at 33%, 40% and 47% in the case of Coconut Biscuits, 10%, 15% and 20% in the preparation of Rusk and Doughnuts and 60%, 80% and 100% in making Muruku the value added products were prepared. With respect to the levels of incorporation of small millet rice flour, there was no significant difference in overall acceptability of Muruku.

INVESTIGATION NO. 6

Project Title: Development of techniques for the control of stored grain insects of milled rice and milled pulses
Investigators: S. Subramanya, R. Chandru, K. B. Munishamanna and V. Palanimuthu

Objectives:

1. To conduct a survey to assess the insect pest complex of milled rice and split pulse dal.
2. To assess the prevailing practices for the management of insects of milled rice and dal.
3. To develop a protocol for the management of insects in milled rice and dal.

Progress:

Status and species of insects infesting (1) milled rice and (2) milled pulses in Karnataka have been found out. Mixing of Boric Acid with milled rice has been found to prevail at wholesaler level and it required about 3-5 washings of rice before cooking in order to remove Boric Acid trace. Boric Acid (2%), Zandu Parad tablets (1%) and Pea Protein (1%) were found to be very effective in controlling insects in milled rice against Rice Weevil; Boric Acid and Zandu Parad tablets were effective in containing the infestation of Red Flour Beetle in milled rice.

INVESTIGATION NO. 7

Project Title: Post Harvest Management (Drying, Distillation of essential oil and utilization of spent charge) of Patchouli (*Pogostemon cablin* Beth.) in pilot scale steam distillation unit and utilization of spent charge
Investigators: V. Palanimuthu, R. Chandru, and B. Kalpana

Objectives:

1. Standardization of raw material handling and drying practices for distillation
2. Optimization of distillation parameters in Pilot Scale Steam Distillation Unit for maximum oil extraction efficiency
3. Utilization of by-products obtained during steam distillation of patchouli
4. Cost-economic analysis of patchouli essential oil extraction process
5. Popularization of developed technology among stakeholders

Progress:

Patchouli herbage dried mechanically using convective tray drier at temp up to 70°C yielded the same quantity of oil with premium quality attributes as that of shade dried herbage. Both packing density (12 kg/m³) and steam distillation time (5h) affected the essential oil recovery (42-66%).

Patchouli spent charge powder could be used as a substitute to wood powder up to 10% level (max. 15%) in the manufacture of agarbattis.

INVESTIGATION NO. 8

Project Title: Minimal processing of jack fruit (bulb, seed and rind)
Investigators: K.B. Munishamanna, K.B. Suresha, R. Chandru, B.Kalpana, and V. Palanimuthu

Objectives:

1. Survey of post harvest practices and assessment of post harvest losses in jackfruits
2. Minimal processing and preservation of jack fruit bulbs
3. Development of ready to eat products from Jack fruit bulbs, and their packaging
4. Utilization of Jackfruit seeds for preparation of edible products

Progress:

Minimally processed jackfruit deseeded bulbs were packed in different MA packages and storage stability of bulbs under ambient and low temperature was studied. Shelf-life could not be improved beyond 4 days of storage under ambient and as well as refrigerated temperature. However, vacuum packaging of minimally processed jackfruit

bulbs could preserve the bulbs up to 3 and 6 weeks under refrigerated and deep-freezing temperature conditions, respectively without affecting sensory quality characters.

The jack fruit pulp blended with 25% grape juice after microbial processing into fermented juice was found to be good with respect to sensory characters of colour, aroma, flavour, taste and overall acceptability when compared to jackfruit pulp alone or blended with other juices.

The minimally processed jackfruit bulbs and seeds were processed to produce vinegar by alcoholic (*Saccharomyces cereviceae*, UCD 522) and acetic acid (*Acetobacter aceti* MTCC 2945) fermentation. The jackfruit bulb vinegar contained acetic acid (5.10%), TSS (3° brix) and pH (4.0) while the seed vinegar contained acetic acid of 4.60%, TSS of 0° brix and pH of 3.0.

The acceptability of jackfruit bulb and seed vinegars was evaluated against different commercial vinegars like apple cider vinegar and other synthetic vinegars by preparing cucumber pickles and preserving them. Organoleptic evaluation of the pickles prepared using different vinegars showed that the sensory score for the pickles preserved in jackfruit bulb vinegar was on par with synthetic vinegars with respect to color, flavour, taste and over all acceptability.

INVESTIGATION NO. 9

Project Title: Development of tubular aeration system for on-farm potato storage in kharif season for southern Karnataka

Investigators: V. Palanimuthu, S. Subramanya, R. Chandru, and KB. Munishamna

Objectives:

1. Study of quantitative and qualitative losses of potato under traditional field / on-farm storage system in Southern Karnataka
2. Identification of biotic and abiotic agents responsible for storage losses of potato under traditional field / on-farm storage
3. Development of pest and disease control strategies for field / on-farm storage system
4. Development of an improved on-farm potato field storage system suitable for Southern Karnataka and work out the cost-economics
5. Popularization of improved on-farm potato storage system

Progress:

Storage study conducted at Agricultural Research Station, Madenur, Hassan District by introducing Tubular Aeration System in the Traditional Storage gave encouraging results. The Improved On-Farm Potato Storage System with Tubular Aeration reduced the PLW by about 2.1% and storage rotting loss by 2.8% when compared to traditional pit storage during Kharif season in Southern Karnataka climatic conditions.

INVESTIGATION NO. 10

Project Title: Development and popularization of under utilized jackfruit based Shrikhand and Kulfi

Investigators: K.B. Suresha, KB.Munishamna, B.Kalpna, and V. Palanimuthu

Objectives:

1. Development of process for the preparation of Jackfruit based *Srikhand* and *Kulfi*
2. Packaging and preservation study of the developed products
3. Popularization and commercialization

Progress:

Process technologies for the production of low fat Jackfruit based *Srikhand* and *Kulfi* have been developed and standardized. *Shrikhand* could be stored for 40 days and *Kulfi* for 6 months under refrigerated temperature. Both the products can be sold as Low Fat Frozen Dessert. Both products were popularized through training programmes to farmers, SHGs and jackfruit growers of Karnataka, Kerala and Goa and also by organizing many "Jackfruit Melas" in various parts of Karnataka and Kerala.

INVESTIGATION NO. 11

Project Title: Development probiotic low fat Dahi fortified with small millet flours (little millet, foxtail millet, proso millet)

Investigators: K.B. Suresha, R. Chandru, B. Kalpana, and V. Palanimuthu

Objectives:

1. To study the effect of addition of different levels of small millet flours on the quality of dahi
2. To test the suitability of commercially available pro-biotic cultures and optimize their levels for the production of dahi
3. Standardization of protocols for the preparation of Fibre Enriched Pro-Biotic dahi
4. To identify suitable packaging material for the developed products
5. Popularization of developed products

Progress:

Preliminary trials to develop small millet flour blended curd using 'previous day curd' showed promise. Freeze dried probiotic culture was used for curd preparation. Dosage level still needs to be standardized. After a thorough search in the market for the appropriate size packs, 200 g cup, 100 g cup and 250 ml pouch have been selected to pack the Probiotic Low Fat Dahi.

ANGRAU, BAPATLA

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre (APC), training and demonstration of technologies

Investigators: Ch.V.V.Satyanarayana

Objectives:

To establish one new Agro-processing centre on cereals and pulses

Monitoring performance of APC

To conduct demonstrations and trainings

Progress:

Different Dhall mill and Rice mill suppliers and operators were involved to impart hands on training to farmer cum entrepreneurs at Agro Processing Centre, KVK, Kavuru. Conducted training programs in collaboration with KVK, Vinayasram at Kavuru. An agro business model with mini mobile rice mill, mini dhal mill and multipurpose flour mill with an initial capital cost of 2.5 lakhs has been formulated for its economic feasibility. The cost economics of small scale processing of paddy, black gram and spices have been worked out.

Information about the agro-processing and central sector scheme was disseminated through various farmer meetings, kisan melas, self help group meetings. Detailed project reports for raw mango powder, dhal mill and milk processing centre with signed bilateral MOU have been prepared and submitted for approval under Central Sector Scheme.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available in the state

Investigators: Ch.V.V.Satyanarayana

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has compiled information on 5 technologies developed by ANGRAU and 8 commercially available technologies from reputed private firms, for submission in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Andhra Pradesh state
Investigators: Ch.V.V.Satyanarayana

Objectives:

To survey the status of agro-processing industries of the state

To compile success stories of 10 no. of agro-processing industries in the state

Progress:

List of production clusters, agro-process and by-product utilization industries has been compiled. Five AEZ's are specified in Andhra Pradesh to export mainly Mango pulp / Mangoes, Grapes, Fresh vegetables, Gerkins and Chillies. Different agencies involved in the development of AEZ's are APEDA, NHB, MFPI, State Govt. and Private Companies with an expected investment of about Rs. 270 crores.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: Ch.V.V.Satyanarayana

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The centre is yet to submit the Schedule 1 (to be filled by beneficiaries) and Questionnaire 2 (to be filled by PI / RE) for the technologies developed by the centre.

Information on the user feed back on ANGRAU turmeric polisher and poly house solar dryer was collected. Details of monetary advantage, drudgery reduction and income generation due to the use of different post harvest equipment promoted under AICRP on PHT were collected. Interacted with manufacturers of ANGRAU turmeric polisher M/S Mathesis Engineers Pvt Ltd, Hyderabad and M/s Farm steel products, Vijayawada. Data on performance indicators of ANGRU turmeric polisher were compiled from users. Total annual turnover is 490 tons. Capacity utilization is only 28%. Cost of operation is Rs. 15/quinatal. The entrepreneur is charging Rs. 20/quinatl. Profit for the year is Rs 24,500/-. Similarly data was collected for poly house solar dryer. The cost of the unit is Rs 1,14,000/-. Subsidy is Rs 57,000/- by the Govt. of Andhra Pradesh. The pay back period is about one year when 50% subsidy is availed.

INVESTIGATION NO. 5

Project Title: Techno-economic feasibility of on-farm concentration of Sweet Sorghum syrup by membrane processing

Investigators: Ch.V.V.Satyanarayana

Objectives:

1. To survey and prepare the techno economic feasibility report

Progress:

Information on agricultural and industrial yields of sweet sorghum was collected. SWOT analysis was performed on the use of sweet sorghum grain for the production of ethanol. Economic feasibility of ethanol production from molasses as well as sorghum grain shows that the sum of the variable cost excluding raw material cost that goes into ethanol production is almost at par from both the sources (i.e Rs 7.50 /lit for molasses and Rs 7.20 - 8.60 /lit for sorghum grain) However, the cost incurred on inputs (steam/coal and electricity components and high water requirement) escalates the cost of

INVESTIGATION NO. 5

Project Title: Techno-economic feasibility of on-farm concentration of Sweet Sorghum syrup by membrane processing

Investigators: Ch.V.V.Satyanarayana

Objectives:

1. To survey and prepare the techno economic feasibility report

Progress:

Information on agricultural and industrial yields of sweet sorghum was collected. SWOT analysis was performed on the use of sweet sorghum grain for the production of ethanol. Economic feasibility of ethanol production from molasses as well as sorghum grain shows that the sum of the variable cost excluding raw material cost that goes into ethanol production is almost at par from both the sources (i.e Rs 7.50 /lit for molasses and Rs 7.20 - 8.60 /lit for sorghum grain) However, the cost incurred on inputs (steam/coal and electricity components and high water requirement) escalates the cost of ethanol-based on sorghum grain. Relatively lesser cost of raw material of sorghum grain makes the grain-based ethanol cheaper by 19-31% to that of molasses-based ethanol. An integral approach to utilize all the byproducts would make the ethanol production from sweet sorghum viable.

Sorghum Yield	→	grain : 1-1.5 t/ha, stalk : 35-40 t/ha
Juice	→	Kharif 16-23% Rabi 10-14%
Juice yield	→	12-14 Kl /ha
Bagasse yield	→	5-7 t/ha (dry wt basis)
Total reducing sugars (glucose, fructose and sucrose)	→	10-14%
Juice extraction rate	→	40-45% in small crushers
	→	60-70% in Three tandem mills
Ethanol recovery	→	6-9% of juice
Ethanol yield	→	1000 – 1400 l/ha (computed)

CIAE, BHOPAL

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre (APC), training and demonstration of technologies

Investigators:

Objectives:

1. To establish one new Agro-processing centre on cereals and pulses
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

Not reported.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available in the state

Investigators:

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 9 technologies developed under AICRP on PHT in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Madhya Pradesh state

Investigators:

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Not reported

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators:

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The centre has submitted the Schedule 1 (to be filled by beneficiaries) for 4 technologies and Questionnaire 2 (to be filled by PI / RE) for 5 technologies developed by the centre.

INVESTIGATION NO. 5

Project Title: Modernization of pulse mill with suitable roller, dryer and good manufacturing practices

Investigators:

Objectives:

Progress:

A dal mill plant of 0.5 t/h capacity has been designed and developed, based on the design of CIAE mini mill (capacity 100 kg/h). Most of the equipment and machineries used in plant were indigenous and selected matching the capacity of the plant. Only pitting mill or dal mill was designed and developed. Pigeon pea is pre-treated with water prior to milling.

The plant comprises of (1) feed control hopper, (2) Bucket elevator of 0.5 t/h capacity operated by 1 hp motor to feed to cleaner-grader, (3) Cleaner-O-Grader of matching capacity operated by 1 hp motor for drive and 2 hp motor for blower, (4) Destoner operated by 1 hp motor, (5) Bucket elevator for feeding the cleaned material into first pitting machine, (6) Fines separator-cum-grader with post aspiration operated by 1 hp motor for drive and 1 hp motor for cyclone. (7) Oil treatment screw conveyor operated by 2 hp motor, (8) Bucket elevator for carrying the pitted materials to soaking tank (9) Soaking tank of 5 t of tur and 300-500 litres of water per batch capacity with receiving and discharge control mechanisms operated by 1 hp motor and water filling and draining systems operated by 1 hp motor drive, (10) Mechanical dryer of 1 t/batch capacity (11) Bucket elevator to feed dried material to to milling machine, (12) Milling (dehusking) machine of 0.5 t/h capacity (13) Dal grader and Aspirator, each operated by 1 hp motor drive, (14) Dal polisher of matching capacity, (15)

Performance evaluation of the new enlarged dal milling machine yielded 75-78 % recovery of dal with 8-11 % brokens and 12-13 % husk. The milling efficiency of the machine was 98-99 %. Overall performance of newly developed machine was very good and similar to roller machine of CIAE mini dal mill. The best performance of the machine was on 600-rev/min speed of the roller. The capacity of the mill was 0.5 to 0.6 t/h.

INVESTIGATION NO. 6

Project Title: Primary processing of medicinal plants (Isabgol, Safed musli, Ashwagandha, Senna)

Investigators:

Objectives:**Progress:**

Traditionally fresh Safed Musli roots are washed and peeled manually using knife and bamboo sticks as practiced by farmers. The process requires about 4-6 hours for peeling one kg of fresh Safed Musli roots by one person. Different mechanisms (aberration using plastic mat, high pressure water jet, combination of aberration and water jet) for peeling of safed musli were attempted. Time of peeling was reduced considerably to about 90 min by the abrasive method and to 50 minutes by water, with material in the range of 20-55 %. Safed musli root samples treated with 5% solution of Cellulase enzyme for 120 min and peeled by water jet at 7 kg/cm² pressures resulted in maximum peel removal. No significant improvement could be observed by lye peeling.

Drying of peeled Musli, untreated and treated by dipping in alum solution (0.01 % w/v) was evaluated using five drying methods, namely, sun drying (43-44 °C), shade drying at room temperature (37-38 °C), solar cabinet drying (56-82 °C), hot air drying at 55 °C and freeze drying. From the colour of the dried Safed Musli measured using Hunter lab Colorimeter, it was observed that treatment of 0.01% alum solution helped in brighter colour. Among the drying methods, the freeze drying yielded in the whitest samples whereas shade drying gave the darkest samples.

The Saponin content (the active ingredient) varied from 5.3 to 9.65% in the dried samples with minimum in sample sun dried without peeling and maximum in sample freeze dried after peeling and 0.01% alum solution treatment.

Senna (*Cassia angustifolia* Vahl.), a small shrub, leaves and pods of which are commonly used as natural laxatives, both in the modern as well as in traditional system of medicines. Traditionally picking of leaves is done by hand at the rate of about 6-8 kg/h. The Senna plant has thorns therefore stripping of leaves involves lot of drudgery and injury. An improved prototype for stripping of Senna leaves was developed consisting of a metallic tube with a circular cutter mechanism at its centre. The device is easy to operate and protects hands of operator from Senna thorns. Using the device one person can strip around 8 – 10 kg leaves/ pods in hour.

OUAT, BHUBANESHWAR

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: Md. K. Khan, N.R. Sahoo and U. S. Pal

Objectives:

1. To establish one new Agro-processing centre and monitor performance of APC
2. To identify suitable NGOs and provide technical know-how for establishment of more APCs.
3. To conduct demonstrations and trainings

Progress:

The Agro processing centre was established at Rajkanika, Kendrapada for processing of pulses and spices which is running successfully. An entrepreneur was identified and supplied with juicer and bottle sealing machine for preparation of RTS from fruits. The unit is operating as Rashmirekha Mushroom Spawn Production and Processing Unit at Gobardhanpur, Pipili. The unit is manufacturing mushroom pickles, chutney, sauce and bari and supplying to the local market. Consultancy and training was given to number of entrepreneurs and farmers for establishment of agro processing centre. Training on cashew apple, /mango processing and dal milling has been conducted at Kendrapada

Under Central Sector Scheme on Post Harvest technology and Management (Component-3 : Demonstration), 2 no. of Vivek millet thresher-cum-pearler were demonstrated for threshing and pearling of ragi at Mallada of Ganjam block and Vikrampur of Rangei block under Ganjam district of Orissa. Fifty three farmers participated in the demonstration programmes.

Under Component-4 : Training of CSS, 2 no. of farmers' training programmes (20 farmers each) of one week duration on "Post Harvest Technology and Value Addition of Agricultural Produce" were conducted during 17-23, March, 2010 and 16-22, August, 2010.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: N. R. Sahoo and K. Rayaguru

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 9 technologies developed by the centre under AICRP on PHT.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Orissa state.

Investigators: U.S. Pal and C.K. Bakhara

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Data on agro and food processing industries in Orissa has been collected from Directorate of Industries and compiled. Ten successful agro processing units in the area of rice mill, dal mill, flour mill, oil mill, spices grinding unit, tamarind concentrate plant, squash and sauce processing unit, cashewnut processing unit, potato chips unit and bari/papad unit were surveyed and the report has been compiled.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: K. Rayaguru and R.K. Patra

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The Impact of Technologies viz. cashew apple beverages, Zero waste technology for osmo dehydrated pineapple products, Dehumidified air dryer, Stone apple beverages developed under AICRP on PHT, Bhubaneswar centre have been assessed and the report in the scheduled format has been prepared.

INVESTIGATION NO. 5

Project Title: Feasibility testing, performance evaluation and popularization of the prototypes developed by other centers in the state of Orissa (Millet pearler from Almora centre, Coconut punch and Snowball tender coconut from Kasaragod centre)

Investigators: C. K. Bakhara, U. S. Pal and K. Rayaguru

Objectives:

1. Feasibility testing, performance evaluation and popularisation of Millet pearler from Almora centre in the state of Orissa

2. Feasibility testing, performance evaluation and popularisation of Coconut punch and Snow ball tender coconut from Kasargod centre in the state of Orissa

Progress:

Millet pearler (Vivek thresher) from Almora centre was procured and tested for its feasibility. Its performance was evaluated both as a thresher and pearler for ragi grains. The capacity was found to be 45 kg/h for threshing ragi panicles. After each 20 minutes the sticks, straw and other remainings are to be removed by taking out the screen. The pearling efficiency was observed to be 95.6% in two pass of operation at 10 to 12% mc (wb). In first pass the separation efficiency was 60-70 %. Traditionally one operator could thresh only 10kg of ragi per hour. The pearling operation is mostly carried out by hand pounding method at a maximum rate of 3 to 5 kg/h per person.

Millet pearler from Almora centre was also tested for dehulling of sunflower and sesamum. The performance of the machine was found to be satisfactory with dehulling efficiency of 95.2% in four passes (78.4% after third pass) for sunflower and 92.4% in three pass for sesamum. The machine was demonstrated at Ganjam, Nayagarh district to the members of self help groups and in farmers' field. The women were trained on threshing, pearling, cleaning and drying operations. The machine was highly accepted by the farmers.

INVESTIGATION NO. 6

Project Title: Development of small scale oil refining unit (100 kg/h capacity) for sunflower

Investigators: U. S. Pal, Md. K. Khan and R. K. Patra

Objectives:

1. To determine effect of different pre-treatments on oil recovery and quality of sunflower oil
2. To determine effect of different refining process on quality of sunflower oil and standardization of the process technology
3. Development and testing of small scale oil refining unit for sunflower oil
4. Storage study of the refined sunflower oil

Progress:

Processing of sunflower seed for oil at farmers' level was surveyed. An oil refining plant was also surveyed to study the unit operations and processing conditions for the refining process. Sunflower seed dehulled in millet pearler from Almora centre with 78.4% dehulling efficiency after third pass of operation were used for oil expelling. Laboratory refining study of crude sunflower oil was conducted. After neutralization of crude oil with 10% (w/v) alkali, the FFA content (oleic acid) reduced from an initial value of 1.65 to 0.25 %.

A small sunflower oil dewaxing unit (40 lit per batch) was fabricated to obtain a completely clear oil that is not affected by low temperature storage. A water cooler with temperature controller arrangement is used for cooling the oil to crystallize the wax and the oil is then forced through a filter by a pump. The unit is expected to work as an intermediate refining process to increase the storability and consumer acceptability of locally pressed sunflower oil.

INVESTIGATION NO. 7

Project Title: Replacement of existing hook system (kundi) for minimizing the pilferage losses during handling / lifting of bags in markets/warehouses/godowns

Investigators: R. K. and Md. K. Khan

Objectives:

1. To replace the existing hook system and minimize the pilferage losses during handling/lifting of bags in markets/ warehouse/godowns

Progress:

FCI godown at Jatni and Orissa State Civil Supplies godown at Bhubaneswar have been surveyed to assess the loss incurred due to use of hook system for handling bags. Hooks of (1.5ft long) are used at godown for lifting of jute gunny bags containing 50 kg rice while transferring from one truck to other. Four hooks are used by two persons (two each) for lifting one bag to the back of another person. Loss through spillage due to hooks was around 30 kg in 100 MT (0.03%) for single handling at a place. Lifting of 50 kg Jute and

HDPE woven sacks bags are carried out at FCI, Jatni from godown to trucks. Spillage was observed to be more in case of plastic bags (20-25 grams per bag) than in jute bags (10-15 grams per bag) due to hook damage of bags.

Bag designs have been modified by the centre with short handles and straps to avoid use of hooks and tested in order to avoid the use of hooks. Providing double layer at both the sides (6") was found to prevent the spillage loss as the double layer resisted the hook to open the woven thread, thereby reduced the damage caused by hook.

INVESTIGATION NO. 8

Project Title: Post harvest management of Stevia leaves for preparation of powder, pellets and extract

Investigators: K. Rayaguru, Md K Khan and N. R. Sahoo

Objectives:

1. To study the effect of different drying methods on quality components of stevia leaves.
2. To develop different usable forms of stevia leaves as sugar substitutes and to have a comparative evaluation of these products.

Progress:

Use of stevia leaves in different forms (fresh, dried and extract) were standardized based on relative sweetness. The equivalent sweetness of 12g table sugar in 100ml water may be replaced by 4 ml. of extract, or 0.75 ml. of concentrated extract, or 0.2 g of dried extract, or 0.5g of stevia powder, or 2 no. of leaf powder tablets.

Aqueous extraction procedure has been optimized to achieve maximum sweetness. Balanced sensory scores were obtained at 6 h and 4 h extraction of dried leaves in cold and hot aqueous methods respectively.

Storage studies revealed that stevia leaves dried at 50 °C, extracted with cold distilled water for 6 h, concentrated to 1/5 th of volume, sealed in sterilized bottles could be stored in ambient condition for 6 months and under refrigerated conditions for one year.

Freeze drying of the extracts have been carried out for pelletizing the extract which could be stored for more than two years under sealed conditions.

To prepare powder, the standardized method comprises washing whole leaves and drying (50 °C, 3h). Around 30 % dried material is obtained after grinding. The powder was divided into two major fractions, coarse (58.5 %) and fine (60mesh, 39.5 %), the rest (2%) being the loss. The requirement of coarse: fine was 2:1 in proportion to obtain the same intensity of sweetness.

Tablets have been prepared using fine (low fibre) stevia powder with a binder and water soluble and effervescent agents. The weight of tablets varied between 220 mg to 250 mg. The products have been evaluated for their performance and have obtained acceptable sensory score.

INVESTIGATION NO. 9

Project Title: Post harvest processing of Aloe-Vera leaves

Investigators: K. Rayaguru, N. R. Sahoo and R. K. Patra

Objectives:

1. To study the quality components of aloe vera juice
2. To develop a small scale aloe vera juice extractor
3. To develop value added products from aloe-vera juice
4. To study the effect of treatment & packaging on shelf life of the developed product

Progress:

Test results showed 20 kg leaves/h capacity for continuous operation of hand operated aloe-vera gel extractor, including time for cleaning operations. The capacity was increased threefold (60 kg leaves/h) by using the motor operated extractor. The gel recovery was 38 and 45 % by manual and machine extraction respectively. The latter provides the flexibility of changing the clearance between the rollers for which it is able to extract the leaves of varying thickness and maturity.

Value added products have been prepared from aloe gel after separation of bitter yellowish fluid (aloin) from the leaves. A nutraceutical beverage and jelly have been

produced. From 30 no. of matured aloe vera leaves (10 kg), 60 bottles of blended (aloe vera gel-lemon-ginger juice) RTS beverage of 200 ml each could be prepared. Similarly 15 no. of 500g bottles of jelly could be prepared out of 10 kg of aloe vera leaves. Storage studies using different treatments (control, KMS) and storage environments (ambient, refrigerated) showed that the value added products were acceptable even after six months of storage under ambient conditions and up to one year under refrigerated storage.

INVESTIGATION NO. 10

Project Title: Post harvest management of mahua flower and seed for decortication and preparation of RTS, jam, squash, seed oil)

Investigators: C.K. Bakhara, N. R. Sahoo and R.K. Patra

Objectives:

1. To study the post harvest practices of mahua flower and seed
2. To develop edible value added products from mahua flower
3. To develop a mahua seed decorticator and its performance evaluation

Progress:

Method for removal of stigma from the inside of the mahua flower was standardized using the millet pearler developed by VPKAS Almora centre. Different value added products like mahua flower bar, candied mahua flower and glazed mahua flower were prepared and the process standardized. The products were appreciated by the sensory panels as well as the consumers. A manually operated mahua seed decorticator of 10kg/h capacity was developed. This equipment can be used instead of beating method practiced by the primary mahua seed collectors, mainly tribal women. Training on preparation of value added products from mahua flower was imparted to the field level workers of an NGO "Vasundhara" and to the participating farmers of the CSS training programmes.

INVESTIGATION NO. 11

Project Title: Comparative study of MAP and shrink wrap packaging techniques for shelf life extension of fresh farm produce

Investigators: N. R. Sahoo, R.K. Patra and K.Rayaguru

Objectives:

1. Effect of different packaging techniques on quality characteristics of fresh produce
2. Effect of packaging materials and storage environment on shelf life enhancement

Progress:

Shelf life of freshly harvested guavas (Allahabad Safeda variety) was studied with different commonly available flexible packaging materials and stored under ambient condition (23-35 °C, 45-75% RH) and chilled refrigerated condition (4-6 °C, 45% RH). The in pack atmosphere arrived at steady state level of 9.1 and 7.8% O₂ and 6.6 and 4.9% CO₂ for the perforated film packs of LDPE and PP after two days in MAP under ambient as well as refrigerated storage conditions whereas in the continuous film packs equilibrium arrived after 3 days of storage.

The samples stored in ambient perforated LDPE and PP remained in marketable condition (≥80%) up to 4 days of storage whereas the highest marketability of 84.38% was observed in perforated LDPE packs under refrigerated condition up to 16 days of storage. The refrigerated samples stored in continuous LDPE, PP, vacuum and shrink pack remained marketable up to 12 days of storage.

INVESTIGATION NO. 12

Project Title: Development of package of equipment for pineapple processing (slicing, dicing and osmotic dehydration)

Investigators: Md. K. Khan, U. S. Pal and C. K. Bakhara

Objectives:

1. Development of pineapple slicing and dicing equipment
2. Development of osmotic dehydrator for pine apple

Progress:

A hand operated peeler cum slicer was developed consisting of SS central shaft to which slicing plate is attached in a spiral form. Once the slicer is penetrated into the whole fruit (cut from both ends), it cuts open the internal core and external peel in one time. The pulp slab is separated and sliced with the device. This hand operated peeler cum slicer works satisfactorily. More than 15 no. of pineapple fruits can be easily peeled and sliced by a skilled worker in one hour by using this device.

An osmotic dehydrator with circulation of sugar syrup and automatic control of syrup temperature has been developed for uniform osmo-dehydration of pineapple rings. The pineapple slices/rings are placed inside different compartments of a perforated steel container formed by partition plates. The perforated container with samples is placed inside a larger steel container containing sugar syrup.

SRS, BURALIKSON

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies (Pilot plant for liquid jaggery)

Investigators: D. D. Singha

Objectives:

1. To establish one new Agro-processing centre on jaggery
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

Establishing the pilot plant for manufacturing liquid jaggery is in progress. Crusher (4-roller) has been procured and installed. Construction of improved 3 pan furnace is in progress and shed to house the pilot plant is under process.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: D. D. Singha

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 2 technologies (Double pan furnace, Herbal clarificant) developed under AICRP on PHT.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Assam state

Investigators: D. D. Singha

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Most prevalent and commonly found agro-processing units in the state of Assam are those for milling and processing of crops like paddy, rice, mustard, spices eg., turmeric, cumin, coriander, garlic, bael, bamboo shoot, flour, wheat, black and green gram and aromatic plant (patchouli). A survey was conducted and information compiled pertaining Atta chakki, Flour mill plant, Dal mill plant, Spice grinder, Sewai making plant, Garlic & bamboo shoot prickle, Bael sarbat, Flaked rice mill, Masala grinding and packing plant, Oil expeller, Patchouli oil extraction, Muri (Puffed rice) making plant and Mini rice mill.

Among these flour mills, masala packing and grinding units and oil expeller are set for large scale processing with large investment. The units have a capacity of processing to the tune of 10 q/h and have an investment over Rs 1 crore. Smaller agro units are established, generally in the production catchments, with an investment of Rs 2 to 20 lakhs and processing a maximum of 1 – 2 q/h raw materials. Spice grinding, atta chakki, rice milling, pickle making and flaked rice making require small investment ranging from Rs 2 – 5 lakhs and are taken up by local youths, SHGs etc. These units are based on locally available raw materials.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: D. D. Singha

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

Not Applicable.

INVESTIGATION NO. 5

Project Title: Adoptive trial on 1. Technology for making liquid jaggery, 2. Powder jaggery, 3. Striking point alarm thermometer

Investigators: D. D. Singha

Objectives:

1. To study the suitability and adoptability of the technology developed at other centres.
2. To transfer the technology to the end users

Progress:

Juice clarified using K-alum, after settling, was heated to 106°C, then cooled and allowed to settle for 72 h. The liquid jaggery so produced has acceptable colour (light brown), transmittance (61.3 %), and texture with low sucrose (42.06 %) and high glucose content (26.37 %) as compared to solid jaggery. The product was more economic than the solid jaggery and recorded higher B:C ratio than the solid jaggery. For making powder jaggery, the clarified juice is boiled to 122°C temperature and then cooled spread over a aluminium tray. The granular powder jaggery was obtained by grinding the solidified mass. For bottling of sugarcane juice the method developed by Coimbatore centre was adopted. The 4 roller cane crusher developed by the TNAU Coimbatore centre was procured, installed and tested for its performance. The juice extraction capacity was 21% higher as compared to the 3 roller horizontal crusher with a cane crushing capacity of 400 kg/h.

Production of liquid and powder jaggery and value addition by improved methods of jaggery production were demonstrated to the local farmers and information disseminated to the consulting entrepreneurs, besides taking up trainings and exhibitions. Manufacturing of liquid jaggery has been taken up at the two agro-processing centers on experimental basis.

INVESTIGATION NO. 6

Project Title: Evaluation of low cost storage system (earthen pot, rice husk and bamboo structure) for long term (8 months) storage of jaggery in humid regions of NE states

Investigators: D. D. Singha

Objectives:

1. To improve the storage system of jaggery for long term storability.
2. To minimize the cost involvement suiting to the need of small scale jaggery manufacturer

Progress:

In the low cost system, jaggery lumps were stored in earthen pots kept inside the bamboo shelves embedded with rice straw. Jaggery samples were stored well up to 4 months and thereafter sucrose content declined by 5.7%, glucose content increased from 10.90 to 12.83, hardness reduced from 3.67 to 3.3 kgs and jaggery colour started showing slight changes. Similar changes in jaggery quality was observed in samples stored in IISR storage bin which was comparable to the low cost system.

TANUVAS, CHENNAI

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies (Demonstration unit for wholesome poultry meat production)

Investigators: Robinson.J.J.Abraham, R. Narendra Babu, S.Ezhilvelan, M.Vidhya, D.Santhi, and V.Appa Rao

Objectives:

1. To study the existing poultry meat processing practices and develop suitable models for hygienic poultry meat processing
2. To develop an Agro-Processing Centre
3. To study the socio-economic feasibility of the developed Agro-Processing centre

Progress:

Design of mobile poultry processing unit was prepared. A fabricator has been identified and the fabrication work is in progress.

A proposal in the prescribed format for the conduct of trainings for farmers, entrepreneurs and scientists during the year 2009-10 has been submitted to the PC for approval under Central Sector Scheme component 4.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: Robinson.J.J.Abraham, R. Narendra Babu, S.Ezhilvelan, M.Vidhya, D.Santhi, and V.Appa Rao

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 3 technologies developed by the centre under AICRP on PHT, on 13 technologies developed by R&D institutions and 5 livestock based commercially available technologies from reputed private firms, in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Tamil Nadu state

Investigators: Robinson.J.J.Abraham, R. Narendra Babu, S.Ezhilvelan, M.Vidhya, D.Santhi, and V.Appa Rao

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Status of various agro-processing industries in Tamil Nadu state has been prepared.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT
Investigators: Robinson J.J.Abraham, R. Narendra Babu, S.Ezhilvelan, M.Vidhya, D.Santhi, and V.Appa Rao

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

Screening of the post harvest technologies/ other low cost technologies developed under AICRP scheme by the other centres near by well suited for our farmers / processors and technologies adopted by near by local farmers is being carried out and further impact of identified technologies will be assessed.

INVESTIGATION NO. 5

Project Title: Development of rapid diagnostic method to detect *Salmonella* spp and *Staphylococcus aureus* from meat and meat products
Investigators: Robinson J.J.Abraham, R. Narendra Babu, S.Ezhilvelan, M.Vidhya, D.Santhi, and V.Appa Rao

Objectives:

1. To isolate the food pathogens such as *Salmonella* spp. and *Staphylococcus aureus* from beef, mutton, chevon, pork and chicken.
2. To characterize *Salmonella* spp. and *Staphylococcus aureus* isolates by molecular techniques.
3. To develop a rapid diagnostic method to detect the above organisms in meats.

Progress:

A multiplex PCR protocol for the simultaneous detection of *Salmonella* spp and *Staphylococcus aureus* from meat samples was standardized with control strains and further optimization with spiked and retail samples is under progress.

INVESTIGATION NO. 6

Project Title: Development of an electrical stunner
Investigators: Robinson J.J.Abraham, R. Narendra Babu, S.Ezhilvelan, M.Vidhya, D.Santhi, and V.Appa Rao

Objectives:

1. To study the existing stunning practices at rural slaughterhouses
2. To develop an electrical stunner for rural slaughterhouses
3. To work out the cost economics of the electrical stunner

Progress:

Trials have been conducted using the electrical stunner on pigs, sheep, turkey, emu, goat and ostrich slaughtered at this department to study the effectiveness of the stunning in terms of development of signs of stunning (electroplectic fit) and bleeding time produced to modify it suitably for various species of meat animals. An Electroencephalogram of the pigs stunned was undertaken, prior to, during and after stunning and death of the animal. The electroencephalograph thus generated clearly demonstrated the efficacy of stunning (i.e. rendering the animal unconscious). The tongs of the electrical stunner are slightly modified and improved with adjustable ends for easy fixing on the animal heads. One electrical stunner has been sold to the Dharmapuri municipality

INVESTIGATION NO. 7

Project Title: Development of Rural Slaughter House

Investigators: Robinson.J.J.Abraham, R. Narendra Babu, S.Ezhilvelan, M.Vidhya, D.Sanathi, and V.Appa Rao

Objectives:

1. To study the existing practice of animal handling and slaughter techniques at rural areas
2. To prepare a design and layout drawing of a model rural slaughter house
3. To develop a model rural slaughterhouse
4. To work out the cost economics of the newly developed rural slaughterhouse

Progress:

Floor plan, elevation, section details and foundation details for slaughterhouses meant for slaughter of 10 cattle /day, 50 sheep or goats/ day (3 models), 100 sheep or goats/ day (2 models), 500 sheep or goats/ day (2 models) have been designed using CAD. Models for mobile poultry slaughter and processing facilities was designed and the CAD designs are being prepared. Models for meat stalls / shops exclusively for small ruminants and large ruminants were designed and the CAD designs are being prepared.

A booklet and a compact disc on construction of slaughterhouses and also the requirements in terms of labour and infrastructure had been developed. A mobile scalding tank was developed. A low cost bell scrapper to facilitate depilation of pig carcasses is being developed. A low cost sausage stuffer operable both mechanically and manually is being fabricated.

INVESTIGATION NO. 8

Project Title: Development of extruded meat products

Investigators: Robinson.J.J.Abraham, R. Narendra Babu, S.Ezhilvelan, M.Vidhya, D.Sanathi, and V.Appa Rao

Objectives:

1. To study the physico chemical properties of beef and chicken meat in relation to extrusion
2. To optimize the parameters for extrusion of meat
3. To develop extruded meat products
4. To conduct experiments on the production of extruded based meat products
5. To work out the cost economics

Progress:

Various recipes are being developed for production of extruded products. Chicken and beef based extruded products have been prepared with rice, malda, tapioca and corn flour and were compared by subjecting them to proximate analysis, sensory evaluation and shelf life studies. The sensory evaluation revealed that corn flour based extruded products were superior in sensory qualities. Electron microscopy scanning studies were carried over to study the cross sectional features of the products developed.

INVESTIGATION NO. 9

Project Title: Development of pet food from slaughter house by-products, agricultural by- products, and market waste of plant origin.

Investigators: Robinson.J.J.Abraham, R. Narendra Babu, S.Ezhilvelan, M.Vidhya, D.Sanathi, and V.Appa Rao

Objectives:

1. To evolve a pet food utilising offals, agricultural by-products and market waste of plant origin. To conduct acceptability trials by offering the pet food produced to pets
2. To optimize the inclusion of various ingredients
3. To conduct shelf life studies and compute economics of the pet food prepared

Progress:

The potential ingredients of pet food among the various offals of pig, market waste from vegetables and fruits and poultry slaughter waste were used for the preparation of pet food. Various methods of drying (sun drying, oven drying, both in combination) the offals were attempted to determine appropriate temperature and duration for drying the offals. The dried products were subjected to proximate analysis and microbial quality analysis. Pet

treats were processed from poultry head meal, feet meal, giblet meal, intestine meal, vegetable market waste and fruit market waste. Trials were conducted by formulating the pet treat with inclusion of intestine meal and without intestine meal as more processing are required for drying intestine.

INVESTIGATION NO. 10

Project Title: Development of designs for poultry processing plant and low cost slaughter equipment for poultry processing

Investigators: Robinson.J.J.Abraham, R. Narendra Babu, S.Ezhilvelan, M.Vidhya, D.Santhi, and V.Appa Rao

Objectives:

1. To design and develop low cost models of poultry processing equipment.
2. To optimize the various process parameters based on the performance of the equipment
3. To conduct trials at the poultry processing unit of the department
4. To conduct sensory evaluation on the poultry meat products produced using the equipment developed

Progress:

Various poultry processing plants in and around Chennai were visited for studying the existing designs. A low cost sausage stuffer was designed which can work manually and mechanically. The equipment was fabricated and assembled in the department for further trials. Necessary modifications are in progress in respect of the height of the shaft, the manual handle and incorporating a limit switch arrangement for safe handling.

TNAU, COIMBATORE

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: M.Balakrishnan, P.Rajkumar, R.Viswanathan and V.Thirupathi

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

The APC at Kanur Pudur, Annur Block, which has been functioning since November, 2002, was visited to maintain machinery installed. The working of micro pulverizer type flour mill for spices grinding (chillies, coriander, turmeric and other spices), turmeric processing units like, turmeric boiler and polisher were monitored for its performance by continuous visit by the scheme staff. One more APC established under the CIDA programme, at Madukkarai, located at 20 KM from TNAU campus, is being monitored by this centre. The activities ventured through these SHG are (i) Production and marketing of pickles from mango, lemon, etc. (ii) Production and marketing of rice batter for making idly, etc (iii) Production and marketing of various ready masala mixes. It is proposed to establish new APC in collaboration with Good Shepherd Mission, a NGO at Karamadai village, Coimbatore District, which is about 35 KM from TNAU, Coimbatore. Preliminary discussion has already been made with the Director of the organization for identifying the potential group to establish and manage agro processing complex efficiently and successfully. Training for manufacturing home made food products like flour (dry and wet), processed dhal and masala powders, pickles, jam and RTS will be imparted to the members of the organization and to market them under the banner of AICRP on PHT. Also, technical guidance will be given to women SHGs to produce agro processing oriented products to earn higher income.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators:

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 7 technologies developed by the centre under AICRP on PHT and on 3 technologies developed by TNAU in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Tamil Nadu state

Investigators:

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Not reported.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators:

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The centre has submitted the cost economics of proven technologies. The centre is yet to submit the Schedule 1 (to be filled by beneficiaries) and Questionnaire 2 (to be filled by PI / RE) for the technologies developed by the centre.

INVESTIGATION NO. 5

Project Title: Development of a multi - crop millet pearler and value addition of minor millets to produce breakfast cereals

Investigators: R. Visvanathan, P.Rajkumar, R. Kasthuri and K.Chendrayan

Objectives:

1. To optimize the pre treatments and process parameters in pearling of millets
2. To develop a multi-crop millet pearler and optimize the process parameters
3. To modify the pearler as required based on the performance evaluation
4. To develop value added product, viz., breakfast cereal (flakes) from pearled minor millets and standardize the process parameters
5. To optimize the process parameters of production of breakfast cereals from millets
6. To popularise the technology through conducting transfer of technology activities.

Progress:

For minor millets, an abrasive type pearler has been designed and developed. The pearler consists of a feed hopper, a tapered stone roller with 23 and 15 cm diameter and length of 30 cm, a perforated concave, which is fitted over the abrasive roller, an aspirator and a cyclone to separate the dust from the milled grain. The milling unit is operated by 3 hp motor and the aspirator is operated by one HP single phase motor.

Three selected minor millets viz., foxtail millet (thenai), little millet (samai), and common millet (pani varagu) were parboiled and sun dried to 10-12% mc for milling. The pearling efficiency was found to be 65, 67 and 68% respectively at 600, 900 and 1200 rpm.

INVESTIGATION NO. 6

Project Title: Standardization of microbial consortia, fermentation and packaging methods for enhancing nutritive value and shelf life for production of home made/commercial idli batter

Investigators: K.Chendrayan, R.Viswanathan and R.Kasthuri

Objectives:

1. To study the microorganisms involved in idli batter fermentation
2. To develop a microbial consortia for ideal idli batter fermentation
3. To optimize conditions for fermentation of idli batter with reference to idli quality, textural characteristics and commercial value
4. To standardize packaging techniques for idli batter with higher shelf life.

Progress:

The microbial population dynamics of idli batter packed in different packaging materials viz., polypropylene (300 and 400 G) bags, polyethylene bags ((300 and 400 G) and aluminium foil bags stored under room temperature, refrigerated and freezer conditions was studied. The results revealed that total bacterial population (25×10^7 CFU g⁻¹) and lactic acid bacterial population (17.5×10^4 CFU g⁻¹) remained almost constant till 13 days of storage in the idli batter packed with PP and PE bags and stored at refrigerated and freezer conditions. Yeast population remained almost constant (12×10^4 CFUg⁻¹) in the idli batter packed with PP and aluminium foil bags stored under freezer conditions till 13 days and 21 days of storage respectively.

The isolates of Lactic acid bacteria and yeast were mass multiplied in Lactobacillus MRS and glucose peptone yeast extract broth respectively for a period of 5-7 days. Then the broth was centrifuged to get the cell pellets. Then the cell pellets were frozen in the freezer for overnight and freeze dried. Freeze dried cultures of lactic acid bacteria and yeast were mixed in equal proportion and filled in capsules under aseptic condition @ 500 mg dried culture/capsule. The rate of fermentation by this mixed inoculum was studied. Fermentation of rice batter was found faster in the inoculated batter (10 h) than in the natural fermentation (15 h) as indicated by the increased microbial population, increase in the batter volume, decline in the pH. Inoculation of microbial consortium (starter culture) enhanced the rate of fermentation of idli batter.

INVESTIGATION NO. 7

Project Title: Design and development of a mango fruit stone remover, mango fruit stone decorticator and equipment for production of kernel flour, starch and oil

Investigators: V.Thirupathi, R.Viswanathan and K.Chendrayan

Objectives:

1. To design and develop a mechanism for stone removal from mango fruit
2. To optimize the various process parameter based on the performance of the unit
3. To conduct trials at mango industries and evaluate the unit
4. To conduct microbial studies on the pulp obtained after stone removal by manual and mechanical method

Progress:

A prototype was developed for removal of stone from the mango fruit. The pulping mechanism consists of number of wooden reapers and nylon brush mounted on a 12 mm dia mild steel shaft and is placed inside a sieve of 6 mm diameter perforation to remove pulp and stone. The second compartment of 460 mm dia and 3 mm perforations is used for straining the mango pulp. Provision of spraying water inside the pulper for cleaning the unit has been made. The mango destoner was installed at M/s. Selva Surya Agro Products India Limited, Dharmapuri. Preliminary trials were conducted with totapuri. Pulp recovery and

pulping efficiency for totapuri variety were 75 and 96%, respectively. With a capacity of 850 kg/h. Recovery of pulp by mechanical destoner was 20% higher than the manual method of peeling and pulping. The unit was also tested with Neelam variety and the capacity and pulping efficiency were found to be 1150 kg/h and 98 per cent respectively.

INVESTIGATION NO. 8

Project Title: Development of suitable packaging for storage of banana with diffusion channel technique

Investigators: K.Thangavel, C.Indu Rani and V.Thirupathi

Objectives:

1. To develop a suitable packaging system for storing banana using diffusion channel system
2. To analyse the quality of the banana stored under different packaging systems for physical, chemical, biochemical and microbiological quality attributes.
3. Selection of the suitable packaging system based on the quality of the banana
4. Popularization and commercialization of the developed packaging system

Progress:

With the standardization of diffusion channel diameter (2.5 mm) and L/D ratio (6), arrangements have been made to conduct commercial trials and long distance transport to select the suitable packaging system for commercializing the banana diffusion channel technique. Diffusion channel boxes of size 241 mm x 241 mm x 241 mm (L x B x H) for storing approximately 1 kg and 2 kg banana were manufactured with suitable polyethylene lining. The process parameters will be optimized for the long distance transport of banana which will be suitable for export package of banana.

INVESTIGATION NO. 9

Project Title: Development and evaluation of probiotic fruit juices/ fruit juice powder as a health drink

Investigators: K.Chendrayan, V.Thirupathi and R.Kasthuri

Objectives:

1. To select suitable probiotic cultures for fortification in the fruit juice
2. To screen different tropical and temperate fruit juices individually and in combination for preparation of quality probiotic fruit juices
3. To study the survival and population dynamics of probiotic bacteria and biochemical changes in probiotic fruit juices during storage
4. To develop a suitable bottling method for probiotic fruit juices with improved shelf life
5. To study the shelf life of probiotic fruit juices
6. To prepare probiotic fruit juice powder by spray drying/freeze drying
7. To find out the acceptability of the fresh, stored and spray dried/freeze dried powder of probiotic fruit juices by conducting sensory evaluation

Progress:

The survival and population dynamics of probiotic bacteria in probiotic fruit juice was studied during storage period. Apple juice stored in two different containers viz., glass bottles and PET bottles was evaluated. The results revealed that maximum population of 36.3×10^6 CFU ml⁻¹ was observed in the apple juice stored in glass bottle inoculated with *Lactobacillus acidophilus* culture and stored in refrigeration (4°C) temperature after 30 days of incubation. Studies on the packaging methods, storage conditions and shelf life of the probiotic apple juice indicated that probiotic apple juice packed in glass bottle and stored in refrigeration recorded a lowest final pH (3.40) and higher total sugar content (5.01%) after fifth week of storage. The maximum 'L' value (43.31) was recorded in probiotic apple juice packed in PET bottle and stored at room temperature condition (25°C) on fifth week of storage. Among the different packaging material and storage conditions tested, probiotic apple juice packed in glass bottle and stored at refrigeration (4°C) temperature condition recorded the maximum total probiotic population of 45×10^6 CFU ml⁻¹ on fifth week of storage followed by probiotic juice packed in PET bottle.

INVESTIGATION NO. 10

Project Title: Optimisation of process parameters of shelf life enhancement of selected fresh cut vegetables

Investigators: R.Kasthuri, Dr.V.Thirupathi and Dr.K.Chendrayan

Objectives:

1. To identify the pretreatments for the selected fruits and vegetables
2. To select the suitable packaging materials and storage conditions for the minimally processed fruits and vegetables.
3. To conduct physicochemical and microbial quality analysis of fresh cut products.
4. To work out the cost economics

Progress:

Minimal processing of Agathi, Drumstick and Fenugreek leaves was carried out and the results showed that pretreatment with chlorinated water (150 ppm) increased the shelf life of green leafy vegetables for a period of 12 days for drumstick leaves, 9 days for fenugreek and agathi leaves; for minimal processing of banana flower, pretreatment with 3% KMS solution increased the shelf life for 7 days and for bread fruit pretreatment with 1% KMS solution increased the shelf life for 14 days with out browning of the minimally processed produce. Comparing the different thickness of packaging material, 350 gauge thick polyethylene bags gave better results with regard to storage period and physico-chemical properties and microbiological characteristics for all treatments.

INVESTIGATION NO. 11

Project Title: Adoptive trial on improved jaggery production process (Mechanical filtration system, Boiling pan tilting mechanism, Striking point indicator, Striking point alarm, Natural clarificants, Two pan furnace system, Jaggery moulding in bricks and cubes)

Investigators: M. Balakrishnan, Dr.R.Viswanathan, Dr.R.Kasthuri and Dr. K.Chendrayan

Objectives:

1. To conduct adoptive trials with the following gadgets/processes, for the improvement of the quality of jaggery : (i) Mechanical filtration system (ii) Rail system with tilting mechanism for the transfer of juice from boiling pan to the cooling pit (iii) Striking point indicator (iv) Striking point alarm (v) Use of natural clarificants in jaggery production and (vi) Two pan furnace system
2. To incorporate the modifications if required for its suitability in Tamil Nadu
3. To evaluate the performance of the gadgets/processes in the traditional jaggery processing units/farmer's holding.
4. To popularize the improved technology and transfer of technology

Progress:

The boiling pan for heating of sugarcane juice has been fabricated from GI sheet. The top diameter, bottom diameter and height of the pan are 9', 7' and 2' respectively. It has been corresponded with Pantnagar centre regarding the purchase of striking alarm indicator and also communicated with Kolhapur centre regarding the fabrication of jaggery processing gadgets. Communications has been sent to the other J&K centres to provide information on the improved jaggery processing technology developed for adoption in Tamil Nadu. The fabrication of rail system with tilting mechanism has been completed. Installation of the boiling pan and construction of cooling pit are in progress.

NDUA&T, FAIZABAD

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: K. Kumar / R.P. Tiwari

Objectives:

1. To establish one new Agro-processing centre on cereals and pulses
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

Over 100 prospective entrepreneurs have been contacted and DPRs have also been provided to 6 entrepreneurs. Intensive efforts are being done to extend technical support in establishment of these APCs.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: K. Kumar / R.P. Tiwari

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

Not reported.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Uttar Pradesh state.

Investigators: K. Kumar / R.P. Tiwari

Objectives:

3. To survey the status of agro-processing industries of the state
4. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Most of the processing industries are functioning in unorganized sector and they have outnumbered the organized sector industries. In the organized sector, the number of different processing industries are reported to be Flour mill -193, Pulse processing -602, Oil seed processing -2153, Rice mills -680, Fruit and vegetables -589, Spices -34, Bakery -170, Milk processing -213, Brewery -18, Meat -35, Abattoirs -320, Sugar mills -110 and Others -121. In the unorganized sector, the number of different processing industries have been reported to be over 30,000 in case of Flour/rice/pulses/oil mills and over one lakh for Bakeries/fruit/vegetables/spices processing units.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators:

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

Not Applicable

INVESTIGATION NO. 5

Project Title: Adaptive trials on improved post harvest equipments developed at different centres of AICRP on PHT (TNAU Tomato seed extractor, Chilli seed extractor, Sugarcane peeler from Lucknow)

Investigators: K. Kumar / R.P. Tiwari

Objectives:

1. To evaluate the performance of the gadgets/machines and incorporate the modifications, if required, for its suitability to the region
2. To popularize the improved technology and transfer of technology

Progress:

These equipments could not be procured due to various constraints. Adoptive trials would be undertaken after procurement.

INVESTIGATION NO. 6

Project Title: Post harvest management of Mint for maximum oil recovery and utilization of distilling waste mint stalk

Investigators: K. Kumar / R.P. Tiwari

Objectives:

1. To study mint oil recovery after one day sun drying of harvested mint crop.
2. To compare mint oil recovery in relation with length of cut of mint stalk.
3. To identify by-product utilization of distilled mint stalk.

Progress:

A distillation plant for menthol extraction plant from CIMAP Lucknow with a cost of Rs. 3.00 lakh has been installed at MCAET Ambedkar Nagar Campus. Short run load test has been conducted and oil recovery from mint in general has been found to be 10-30 per cent. Great variation in oil recovery was observed on account of mint variety, storage of crop, quantity of batch and digestion time and temperature, which need to be standardized.

CAU, GANGTOK

INVESTIGATION NO. 1

Project Title: Development of cardamom polisher for tail removal

Investigators: Brijesh Srivastava and A. I. Singh

Objectives:

1. To study the performance of the polisher procured from Spice Board
2. To develop hand operated cardamom polisher for farmers
3. To develop power operated cardamom polisher for traders

Progress:

Cardamom polisher available with Spices Board, Tadong was studied and its performance was evaluated. Effect of speed of rotation of vanes of the polisher, quantity of feed per batch and moisture content of the dried large cardamom capsules on the performance of the polisher was studied for optimization of its performance. A hand operated cardamom polisher has been designed and the study on its performance evaluation has been planned. Since large cardamom is a seasonal spice crop, its performance evaluation study is scheduled for the period October to December, 2010.

INVESTIGATION NO. 2

Project Title: Drying of selected horticultural crops produced in NEH Region

Investigators: Brijesh Srivastava and Sujata Jena

Objectives:

1. To study the drying characteristics of selected crops
 2. To develop the process technology for value added products from selected horticultural crops
 3. To develop the mathematical models for drying of selected crops
- To determine the shelf life of dried products based on storage studies and qualitative evaluation.

Progress:

Physico-chemical evaluation of ginger, cherry pepper and turmeric is under progress. Preliminary investigations on osmotic dehydration of ginger have been started. The osmotic agents selected for the study includes sodium chloride solution (10% and 15%),

sucrose solution (40 – 70°Bx), and various combinations of sucrose and sodium chloride solution. Other process variables include process temperature (30-65°C), ratio of sample to solution (1:5 – 1:20) and osmotic dehydration time (0.5 – 5h). The data of water loss and solid gain during the osmotic dehydration is being collected. Preliminary trials on solar drying of cherry pepper, ginger and turmeric in CIAE solar cabinet dryer is under progress. Preliminary trials on hot air drying of ginger and turmeric in CIAE vegetable tray dryer are going on.

INVESTIGATION NO. 3

Project Title: Effect of edible coating and packaging treatments on storage behavior of selected fruits and vegetables produced in NEH region

Investigators: Brijesh Srivastava, Sujata Jena and A. I. Singh

Objectives:

1. To study the effect of edible coating on shelf life of selected fruits & vegetables
2. To study the effect of different packaging material & methods on shelf life of selected fruits & vegetables

Progress:

Preliminary investigations on preparation of paraffin wax based emulsions (with mustard oil and refined soyabean oil) have been started. The vegetables selected for the study includes cherry pepper, lemon and tomato. Manual methods of coating applications are being tried at present Preliminary experimental trials on packaging studies of cucumber, passion fruit and sikkim mandarin were done.

CCSHAU, HISAR

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: D.K. Sharma, and V.K. Singh

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

Arya Nagar (Distt. Hisar) and Binzol (Distt. Panipat). Two agro processing centres were established by Sh. Balwant Jindal and Sh. Dilbagh Singh respectively. The Arya Nagar agro processing centre was for aonla preserve (Murabba) and Binzol agro processing centre was for soya milk and tofu. 12 trainings and 6 demonstrations were given. Six farmers-entrepreneurs after the demonstration on various machines signed license agreement with the University.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: V.K. Singh and D.K. Sharma

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

Two technologies from HAU, namely aonla pricking machine (manually operated) and aonla pricking machine (power operated) were documented for data base development.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Haryana state

Investigators: D.K. Sharma, and V.K. Singh

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Ten success stories have been collected on 1. Gaur gum industries (Case of Jai Bharat gum & chemicals limited at Siwani (Hisar), 2. Dehydrated fruits and vegetables (Case Pan Foods, Panipat), 3. Grain storage (Case of Adani groups, Dhand, Kaithal), 4. Milk processing (Case of Vita dairy processing), 5. Rose processing (Case of Sirohi Farms), 6. Aonla Processing (Case of Sh. Sumer Singh), 7. Turmeric Processing (Case of HAFED plant, Radour, Yamuna Nagar), 8. Rice processing (Case of Picric Rice, Ganuar, Sonapat), 9. Oil mill / Processing and 10. Dal Mill/ Processing

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: D.K. Sharma, and V.K. Singh

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

Prescribed proformas for impact assessment were documented.

INVESTIGATION NO. 5

Project Title: Adaptive trials on Soya milk processing plant

Investigators: D.K. Sharma, and V.K. Singh

Objectives:

1. To develop soya milk based products.
2. To impart demonstration and training for the adoption and popularization of soya milk based products.

Progress:

To prepare whey based soymilk single and double extraction were compared. Whey - soybean was used in the ratio 9:1, 5:1 and 4:1. Double extraction was found much better on the basis of higher milk yield and very low okara remained although the sensory quality of both the products was at par.

As per the organoleptic evaluation results, soybean soaked in 0.2% NaHCO₃ followed by steaming for 10s, hulling and extraction sample was ranked the highest.

Whey soy chocolate milk was prepared by selecting appropriate level of sugar and cocoa powder on the basis of sensory attributes.

A farmer from Binzol (Panipat) was trained with demonstration to prepare soya milk in "Soya Cow" (trade name for soya milk making machine). This farmer-entrepreneur, Sh. Dilbagh Singh, has now started an agro-processing centre at Binzol (Panipat).

INVESTIGATION NO. 6

Project Title: Field evaluation and testing of equipment developed by other centres : Aloe Vera gel extraction machine from (1) Bhubaneswar, (2) Jaipur and (3) Udaipur centres

Investigators: D.K. Sharma, and V.K. Singh

Objectives:

1. To evaluate aloe vera gel extraction machine from three different centres
2. To impart demonstration and training for the adoption and popularization of aloe vera gel extraction machine.

Progress:

Purchase of Aloe vera gel extraction machine from Bhubneshwar, Jaipur, Udaipur centres is under process. For adoption and commercialization of aloe vera gel extraction machine and product. One entrepreneur Mr. Kailash Gupta from Hisar was identified and given exposure at Udaipur. He was interested to emulate the example of Aloe vera self help group for the processing of aloe vera gel.

INVESTIGATION NO. 7

Project Title: Post Harvest Management of selected medicinal plants (primary processing, packaging and storage of Mulathi, Satawar)

Investigators: V.K. Singh D.K. Sharma

Objectives:

1. To standardized primary processing operations for the preparation of Satawar and Mulathi powder and its characterization in terms of principal ingredients.
2. To recommend package of practices for the storage and packaging of Satawar and Mulathi powder.
3. To standardize process for development of value added products from Satawar and Mulathi and its characterization in terms of principal ingredients.

Progress:

Satawar and Mulathi in the form of raw roots were obtained from the fields and dried to form its powder. The characterization of raw material and final products were carried out. The satawar and mulathi Powder was used to form guava-mulathi toffee and pasta products respectively.

INVESTIGATION NO. 8

Project Title: Mechanization of petha candy production

Investigators: D.K. Sharma, and V.K. Singh

Objectives:

1. To test and refine in the design of petha pricking machine

Progress:

Aligarh centre purchased the Petha pricking machine from M/s Moti Engg. Works, Hisar (Licensee of University technology). The AMU centre has given the feedback and suggested to amend the size of petha prickers with the help of local artisans at Aligarh in consultation with Hisar centre.

INVESTIGATION NO. 8

Project Title: Performance evaluation of carrot washer (Bahabalpur)

Investigators: D.K. Sharma, and V.K. Singh

Objectives:

1. To assess the cleaning capacity and efficiency of carrot washing (Bahabalpur).
2. To refine the design of carrot washer (Bahabalpur)

Progress:

Batch type system of carrot washer was evaluated. Local manufacturer Sh Krishan Jangra approached Hisar centre to make the batch model as Continuous carrot washer. Now, Mr. Krishan Jangra has become member of Business planning and development unit (BPD) at Haryana Agricultural University, Hisar. The continuous type carrot washer is getting popularity in custom hiring system

JNKVV, JABALPUR

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators:

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

As per the recommendations of the Administrative Council of the University, an advertisement was placed in the local newspapers inviting interested NGO'S, cooperative societies to express their interest in establishing agro processing centers in their area. Applications were received from 12 NGOs. 10 models of Agro processing units were presented to various NGOs highlighting the benefits. About 18 demonstrations were carried out to familiarize the interested NGO, individual farmers and entrepreneurs with the available technologies and agro processing models.

No. of training conducted under CSS were : Agro Processing – 07, Soy Processing – 11, Pulses Milling – 04, Pea Shelling – 04, Guava Processing- 02, Cereals Processing – 02 and Vegetable Processing - 02.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators:

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 4 technologies developed.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Madhya Pradesh state.

Investigators:

Objectives:

Progress:

Under this project survey work has been conducted in Gwalior district. There are more than 15, 249 micro and small enterprises as well as large and medium industries. Due to this it has been registered under industrially developed district. There are about 26 food processing units in the district.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators:

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress: Not reported.

INVESTIGATION NO. 5

Project Title: Adaptive trials and feasibility testing of technologies developed at other centres of AICRP on PHT for local conditions (safed musli peeler from CIAE Bhopal).

Investigators:

Objectives:

Progress:

Feasibility testing trials to test the adaptabilities of CFTRI dal mill for milling of Pigeon Pea (variety T-21) grown in Jabalpur region was conducted. Preconditioning treatments helped in improving the milling performance. Best milling results are obtained when Pigeon Pea was soaked for 1 hour, sun dried for 1 day and then milled. at ambient temperature.

Tray dryer designed by CIAE was tested for its performance for dehydration of medicinal plant products, namely Aswagandh and satawar Roots. Fresh Ashwagandha root when dived in shade takes about 10-11 hr for 22-24% moisture depletion in the temperature range of 30-32°C while sun drying it takes about 7 h. In the tray dryer, it took about 165 min for 48-53% moisture depletion in the temperature range of 54-62 °C. The splitting of intact satawar root was found essential for achieving higher drying rates.

INVESTIGATION NO. 6

Project Title: Design, Development and Testing of Groundnut Testa Remover

Investigators:

Objectives:

Progress:

A groundnut testa remover was developed, consisting mainly of three units - stripping, shelling, and cleaning unit. The shelling unit was tested and constructed as per BIS No. 8824 -1977. Best of shelling efficiency were 67.23%, 65.60% and 68.88% over nylon fiber mate, denim cloth sheet and canvas sheet respectively. The capacity of the machine is 40 kg/h. The processing cost of machine was calculated to be 0.80 Rs./kg,

INVESTIGATION NO. 7

Project Title: Post Harvest Management of Medicinal Crops (Processing of Safed Musli, Ashwagandha and Satawar)

Investigators:

Objectives:

Progress:

Investigation was conducted to study the processing of 3 medicinal crops viz. Safed Musli (*Chlorophytum Borivillianum*), Satawar (*Rauwolfia Serpentina*) and Ashwagandha (*Withania Somnifera L.*). Their engineering properties, peeling efficiency and drying characteristics were also studied. Peeling output of Safed Musli (2.0kg/day), Satawar (2.95kg/day) and Ashwagandha (3.2kg/day) was found to be maximum when peeling was done by rubbing the preliminary soaked root with gunny bag. Whole peeled roots of Safed Musli and Satawar took 72 hr to dry. Peeled whole pieces of Ashwagandha took less time to dry in the tray dryer (55 h) followed by Satawar (60 h) and Safed Musli (57 h). Minimum drying time of 1.3 hours was observed by drying in mechanical dryer at air velocity ranging between 1.62-1.88 m/sec. and the temperature of the product being in the range 85-92°C. At this condition the colour and saponin content was observed to be 79.74% in terms of lightness and 0.743 respectively.

RAU, JAIPUR

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators:

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress: Not reported.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators:

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:
Not reported.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Rajasthan state

Investigators:

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress: Not reported.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators:

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress: Not reported.

INVESTIGATION NO. 5

Project Title: Post Harvest Management of aonla & aloe vera

- 1) Development of aloe vera juice extactor
- 2) Shelf life improvement of aonla for off-season use
- 3) Value added products from aonla and aloe vera (Aonla Shreds, aloe juice, aloe gel & aloe powder)

Investigators:

Objectives:

Progress:

Some physical characteristics (length, breadth and weight of the leaves and peel thickness) and Proximate and biochemical compositions of different ecotypes of aloe vera were studied. The leaf moisture content varied from 95.06 % while the maximum moisture content of pulp was 98.12 %. The ascorbic acid ranged from 29.52 to 36.19 mg/100 g of sample. β -carotene ranged from 10.97 to 11.29 mg/100 gm of sample. The highest TSS and aloin content were recorded to be 1.83 % and 0.95 % respectively. The biochemical composition of all the three ecotypes studied was however found statistically at par.

Experiments were conducted on shelf life improvement of raw aonla for off season use, by various treatments of sodium chloride, sodium benzoate, potassium-meta-bisulphate and their combinations. It was inferred that for increasing shelf life up to two months of fresh aonla fruits, KMS 0.2 % in combination with NaCl 1% can be used.

INVESTIGATION NO. 6

Project Title: Post Harvest Management of Henna
1. Development of a mechanical henna harvester
2. Standardization of henna leaf drying process

Investigators:

Objectives:

Progress:

Henna leaves drying process was standardized. In general henna leaves dried faster under sun drying compared to shade drying but shade drying resulted in a natural green colour of henna powder. A bed thickness of 45 cm under shade drying (14-31 °C) was found optimum to reduce the initial moisture of henna leaves from 37 % to 15 %. A drying period of 5 days was found optimum to reduce the moisture level up to 15% in the drying bed thickness up to 45 cm.

A rotary steel blade driven by a 0.5 hp petrol engine was used for harvesting henna. The unit can be carried and operated easily by a person. The field capacity and petrol consumption by the engine were observed as 0.125 ha/h and 8 lit/ha respectively against 0.00738 ha/h field capacity of traditional sickle. Thus the mechanical harvester can replace 17 man days. Timely harvesting results in good quality henna leaves and hence can fetch better income.

INVESTIGATION NO. 7

Project Title: Effects of varieties and harvesting stage on gum content of cluster bean

Investigators:

Objectives:

Progress:

The varietal effect on gum content was found significant. HG-365 had maximum gum content (30.5%) followed by RSG-1038 (29.4%), HG-563 (28.9%), G-2 (28.37%) and RSG-1003 (28.1%). HG-365 had significantly higher gum content than other varieties.

INVESTIGATION NO. 8

Project Title: Adaptive trials on :
1. Zero energy cool chamber
2. Junagadh Cumin Cleaner cum graded
3. Hisar model Aonla pricker
4. CIAE Padel cum power operated grain cleaner/ grader
5. Solar tunnel drier

Investigators:

Objectives:

Progress:

One quintal capacity Zero Energy Cool Chamber of IARI design was constructed and evaluated during summer and winter months for storage of different types of seasonal vegetables and fruits. 20 kg each of different commodities (Cauliflower, brinjal, tomato, carrot, pumpkin, aonla, ridge gourd, tinda, papaya, capsicum, okra and bottle guard). 20 kg each were stored in 6 plastic crates in two layers. The cauliflower, brinjal, tomato, aonla, pumpkin and carrot could be stored safely up to 14, 24, 24, 13, 24, and 19 days respectively against the shelf life of 5, 8, 8, 4, 19 and 6 days respectively under controlled condition. The weight loss due to storage in cool chamber was 14, 17, 31, 24, 15, and 41% respectively against weight loss of 17, 16, 28, 25, 16 and 28% respectively under controlled condition.

The vibrating double screen type 1210 x 1000 x 1000 mm size Junagarh cumin cleaner cum grader has a feed hopper, sieve box, blower, power transmission unit (1 hp motor of 1440 rpm) and a frame. The cumin cleaner cum grader machine was installed in PHT laboratory and tested at 4 feed rates on cumin crop threshed one week earlier. The cleaning efficiency of first grade cumin varied from 92.8 to 98.52% at different feeding rates, the maximum being at 48.8 kg/h feeding rate. Similarly the cleaning efficiency of second grade cumin varied from 64.2 to 78.2% at different feeding rates, the maximum being at 48.8 kg/h feeding rate. The moisture content of cumin was 8.1%. It indicated the machine's suitability for a feeding rate of about 50 kg/h. A grain loss of about 3.0% was observed with the straw at cumin straw outlet.

INVESTIGATION NO. 9

Project Title: Development of a cumin thresher (50 kg/h capacity)

Investigators:

Objectives:

Progress:

A cumin thresher was developed to cater to the need of the farmers for threshing of cumin crop replacing its traditional manual threshing. The thresher can be operated by a 5 hp motor or by a small tractor. The thresher was extensively tested for its feasibility in the farmer's field (Danta Ramgarh village in Sikar district and Bainsra village in Jalore district). It has a field capacity of about 95 kg/h, a threshing efficiency of about 99%, a cleaning efficiency of about 87%, a blown grain loss of about 0.5%, a spilled grain loss of about 0.9% and a negligible broken grain loss. The unit costs Rs. 45,000/ including a 5 hp motor with starter. Use of the cumin thresher resulted in a labour cost reduction of Rs. 50.6/q and annual profit of about Rs. 12,600 as compared with traditional manual threshing.

CAZRI, JODHPUR

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators:

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress: Not reported

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators:

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress: Not reported

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Rajasthan state.

Investigators:

Objectives:

Progress: Not reported

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators:

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress: Not reported

INVESTIGATION NO. 5

Project Title: Process development for bakery and extruded products from pearl millet

Investigators: P. K. Malaviya, H C Bohra, Pratibha Tiwari, and P. Sharma

Objectives:

1. To study the existing methods of processing, storage and consumption pattern of pearl millet.
2. To develop processing technique and method for the better acceptability and also develop suitable machinery for this work.
3. To develop the process for making products from pearl- millet.

Progress:

In pearl millet, due to high fat content its storability is poor, particularly of its flour. A small capacity pearler has been developed for pearl millets. The mill rotors consist of two 98 mm diameter and 13 mm thick carborundum grinding wheels driven by 1.0 hp electric motor. Each wheel is separated by 5 mm where clearance of 2.5mm is maintained between wheels and pearling chamber. The grain is fed through the top and passes through rotating wheels. The pearl millet grains are processed by friction and abrasion operation. The low fat pearled grains are collected at the bottom. Analysis for chemical constituents indicated that grit fraction has 4.3 % ash contents (minerals), 18.90 % crude protein and 17.0 % ether extract (lipid) making it a good source of dietary energy.

AAU, JORHAT

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: A. Borah

Objectives:

1. To select suitable site, in co-operation with local farmers and voluntary agencies.
2. To undertake study of a cluster of villages with respect to processing of farm produce, demand for processed food and their supply.
3. To identify suitable equipment and technologies based on the types of farm produce and processed products demand and to examine their techno-economic feasibility.
4. Installation of processing equipment and machines in a selected rural area to develop an agro-processing complex.
5. Testing of equipment and machines in the complex for optimizing their performance.
6. To evaluate techno-economic feasibility of each component of the agro-processing centre.

7. Training of rural artisans and unemployed youths in operation, repair and maintenance of processing machine, home scale processing of local produce and management of the complex.

Progress:

The first APC under the centre established at "Allengmora", has been running smoothly and the beneficiary group so far repaid six yearly installments.

The second APC has been established at Roha, through a SHG named Rohdoiya Atmo Sayahak Gut. The processing machines installed are Rubber roll sheller with Horizontal cone polisher & cleaner with matching motor & starter of capacity 500 kg/h; Oil expeller (4-bolt) with filter press, matching motors and starters of capacity 50 kg/hr; Wheat grinder: 50 kg/h, Spice grinder: 30 kg/h, Turmeric boiler: 100 kg / batch; Jute ribboner, pedal operated, with a total cost involvement of Rs.2, 85,175/-. First year installment has been repaid.

The third APC earmarked for Sonitpur district has been set up at Bihaguri, under a SHG named Bihaguri Seuji Krishok Sammittee about 18 Km from Tezpur. Equipment earmarked and supplied to the SHG are Rice sheller with 5 H.P. motor and Polisher with 7.5 H.P. motor and starter ; 4-bolt oil expeller and filter press with 7.5 H.P and 1 H.P. motors respectively with matching starters ; Spice Grinder with motor & starter ; Wheat grinder with motor & starter and a sgarcane crusher with 5 H.P. Motor & starter. Total cost involvement is Rs.2, 75,804/-. Installation and commissioning work has been completed.

Monitoring and supervision of all the APC has been done on a regular basis.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: P. Patgiri, and S. Alam

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 6 technologies developed by the centre under AICRP on PHT in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Assam state.

Investigators:

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Completed database development for the districts of Golaghat and Jorhat. The status of commercial processing units for paddy, wheat, pulse and spice were evaluated and cost of machinery, installation and overhead cost were enumerated.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: P. Das and P. Patgiri

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The fresh rhizomes stored at ginger storage structure constructed at the village Kasomari, Golaghat Dist are successfully utilized by the farmers both for seed purpose and a part also sold for edible purpose. They (four farmers) have stored in total 800 kg fresh rhizomes of which 437 kg sold within 3 months of storage and collected Rs15,495.00, 73 Kg was weight loss, 290 kg was used as seed rhizome.

Similar study is being carried on at a place called Hnahthial by KVK Lunglei, Mizoram for last five months. So, far they have recorded 10 percent wt loss for 100 kg fresh rhizome stored.

The tentative profit made by GINFED Ltd, Diphu, Karbi Anglong Dist, Assam through processing of raw ginger 399 kg worth Rs 6,695.00 into low cost value added products of 60.05 kg (paste, candy, salted and dry ginger) is worth about Rs 20,000.00

The technology developed under AICRP on PHT at AAU have shown its effectiveness at small farmers'/ entrepreneur's level.

INVESTIGATION NO. 5

Project Title: Adaptive trials and feasibility testing of technologies developed at other centres of AICRP on PHT and commercially available appropriate technologies for Assam conditions :
(Papad making machine, Ginger washing machine from Bhubaneswar centre and Ginger peeling machine from Udaipur centre)

Investigators: A. Borah

Objectives:

1. Testing and evaluation of technologies/equipment namely : Ginger washing machine, Ginger peeling machine and Papad making machine.,
2. On farm demonstration under PRA mode of adaptable and economically feasible technologies/ equipment for Assam conditions.

Progress:

Ginger washer has been received from Udaipur centre recently. Purchase formalities for a commercial Papad making machine are on.

INVESTIGATION NO. 6

Project Title: Bio-control of storage insect pest of rice, green gram and black gram

Investigators: P. Patgiri and P. Das

Objectives:Experiment-1

- Testing the efficacy of different formulations of orange peel and black pepper seed against stored grain insect-pests of rice, pulses
- Preparation of desirable formulations of orange peel and black pepper seed.
- Proximate analysis of treated rice, wheat and maize.
- Effect of treatments on grain quality in terms of texture, colour, viscosity and organoleptic aspects.
- Development of IPM module for storage of rice and pulses.

Experiment No-2

- To know the allelochemical effect of plant extract *in vitro* in the management of common post harvest insects.
- To know the allelochemical effect of plant extract *in vitro* in the management of common post harvest pathogens.
- *In vivo* testing of the promising plant extracts.

To evaluate cost effectiveness of the selected plant extract.

Progress:

Effect of application of botanical 'C' on mortality rate and infestation level of *Callosobruchus chinensis* on green gram have been recorded and it was found that botanical 'C' was very efficient in controlling the infestation of *Callosobruchus chinensis* on

green gram during storage. Botanical 'C' being very cheap (1 kg of green gram can be stored for a period of at least nine months at a cost of 10 paise only) can be used for safe storage of green gram. The overall acceptability of botanical 'C' treated (dose 50 ppm) grain stored for nine months was found to be of four out of five in Hedonic scale.

INVESTIGATION NO. 7

Project Title: Evaluation and demonstration of technology for extraction of starch from tapioca varieties of N.E India.

Investigators: P. Das and A. Borah

Objectives:

1. To evaluate the extraction potential and quality of starch from tapioca varieties grown in the North Eastern region of India.
2. To conduct training on extraction and utility of starch to prospective entrepreneurs

Progress:

Tapioca, 'Balijan' was found suitable for value added products such as chips, flour and starch. The quality of laundry starch from local collection of tapioca showed warp stiffness of 6.0 and weft stiffness of 3.3. Gum produced from tapioca starch had good flowability, resistance to microbial growth and of low cost. Five safe holi colours (green, blue, red, yellow and chocolate) were also developed with acceptable texture (53-250 micron), stickiness and colour-fastness remaining till 45 days. Demonstrations (5 no.) and training (2no) on value added products from tapioca were conducted. Development of low cost, safe "holi" powder and low cost good quality gum

INVESTIGATION NO. 8

Project Title: Development of a combination drying system (solar and biomass furnace) for drying of ginger and black pepper

Investigators: A. Borah and P. Das

Objectives:

1. Conduct experiments to study the drying kinetics.
2. Design and Development of the drying system.
3. Optimize the energy efficiency of the drying method under various operating conditions.
4. Evaluate the effects of optimization of the drying system on product quality, particularly on the retention of color, texture, flavor, enzyme activity, volatile oil content and oleoresin.

Progress:

Experiments to study the drying kinetics of ginger and black pepper were carried out. The value of drying coefficient (K) and the equilibrium moisture content at different temperatures, were determined. Design and development of the drying system has been conceptualized. Estimated dryer capacity would be 50 kg sliced fresh ginger per batch. The whole system would be power independent natural draft, solar and bio-fuel based. Fabrication is under progress. Purchase formalities for turbo ventilator have been completed and purchased.

INVESTIGATION NO. 9

Project Title: Value addition to locally available vegetables through minimal processing (Leafy vegetables : spinach, khutura, lai, morisa, bhagalpota, dhekia: Vegetables : beans, cauliflower, carrot, cabbage)

Investigators: S. Alam and A. Borah

Objectives:

1. Standardization of post harvest treatment (s) for value addition Shelf life evaluation of cut vegetables in different packaging systems under ambient and refrigerated condition
2. Evaluation of market acceptability of the products

Progress:

It was observed that dewatering of cut vegetable pieces under the prevailing environmental condition could not be carried out properly, so formalities to purchase a basket centrifuge from CIPHET, Ludhiana, had been taken up with the concerned authority.

INVESTIGATION NO. 10

Project Title: Biocontrol of crown rot of banana

Investigators: P. Das and A. Borah and M. Changmai

Objectives:

1. Identification of effective botanical (s) for management of crown rot disease of banana
2. Standardization of the extraction techniques of the active biomass from the identified botanical (s)
3. Preparation of a bio-active paste for managing crown rot disease

Progress:

The experiments showed that the extract from basil (100 g leaf in 50 ml of distilled water) and Sulphur paste (10%) were effective in controlling crown rot of banana fruits.

INVESTIGATION NO. 11

Project Title: Value addition of indigenous fruits (Jamun, Ber and Banana) of Assam

Investigators: S. Alam and A. Borah

Objectives:

1. To evaluate the quality of value added products made from indigenous fruits of Assam through non fermentation and fermentation technology.
2. To standardize the process for optimum production of value added products from indigenous fruits by non-fermentation and fermentation technology.

Progress:

RTS beverages were developed from banana and jamun and both were stored at room temperature. All the three forms for jamun (Juice, nectar and RTS developed with stevia, the non-calorie sweetener) were well accepted up to 4 months after preparation. The banana RTS was found to be good in appearance, but not in taste and flavour.

INVESTIGATION NO. 12

Project Title: Preparation of Candy from peel waste of indigenous citrus (khashi mandarin, pummelo and citron) fruits

Investigators: S. Alam and A. Borah

Objectives:

1. To standardize the method of candy making from citrus peel.
2. To evaluate acceptability
3. Promote entrepreneurship

Progress:

Peel of Citron, Orange and Pummelo cured in 8% NaCl solution, followed by washing in warm water resulted in better quality products than other methods and scored higher in sensory evaluation. In the second phase candy from Citron peel have been prepared by curing in 8% NaCl solution, followed by washing in warm water for storage studies. Storage studies are in progress.

JAU, JUNAGADH**INVESTIGATION NO. 1**

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: K. K. Jain, V. K. Chandegara, A. K. Varshney and V. M. Bhatt

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

The APCs were contacted and visited for their monitoring. In the year 2009, at Tadka pipliya APC, processing of 2275 kg of wheat, bajra, jowar and maize for flour milling was completed. In the year 2010 (up to August, 2010), this centre processed about 3180 kg of groundnut i.e. 53 tins of oil @ Rs. 75 per tin, flour milling of about 8500 kg wheat, bajra and maize (50-60 kg per day) @ Re. 1 per kg. Few farmers also cleaned and graded wheat in Cumin cleaner and grader machine.

At Fareni centre, in the year 2009, a farmers meeting was arranged in the month of January and demonstration of oil mill was completed at Fareni APC. In the year 2010, all the machines installed at this centre were got serviced, repaired and coloured. A joint meeting of Fareni mandli and PHT staff was conducted. Visits were made along with constituted committee members to nearby villages Bhiyal, Monpari, Maliya Hatina, Chaprda and Bamnasa for establishment of new APCs..

Under Central Sector Scheme, cumin cleaner cum grader machine was demonstrated at Khapat, KVK (Porbandar) and Bhod village (Ta. Ranavav Dist. Porbandar) among farmers and officials of KVK – Khapat. Good response and feedback was obtained from them about cumin cleaner cum grader performance. The machine needed few modifications for better efficiency. Four proposals namely, Establishment of cleaning and grading unit for wheat and groundnut at Vithalpur village (Rs. 0.80 lakh, Amreli), Upgradation of existing setup for production of fruit syrups and beverages (Rs. 13 lakh, Junagadh), Establishment and upgradation of cleaning and grading unit for wheat and groundnut at Bamnasa (Rs. 2.50 lakh, Ghed) and Production of groundnut milk and panner unit (Rs. 10.20 lakh, Junagadh) were submitted with signed MOU under the CSS component 1.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: K. K. Jain, M. N. Dabhi, V. M. Bhatt and A. K. Varshney

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

Prepared, collected and compiled information on proven technology / equipments developed at AICRP on Post harvest technology centre and department of Agril. Process Engineering, JAU, Junagadh. The information was submitted in September 2009. Visits and contacts were made for preparation, collection and compilation of information on proven technology / equipments developed in the Gujarat state (Jasdan, Rajkot and Anand). The collected information was submitted in January 2010.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Gujrat state.

Investigators: M N Dabhi (Horticultural crops), Sh. V K Chandegara (Food grain crops), Dr. K. K. Jain; Sh. R.D. Dhudashia and Sh. A.M. Joshi

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Small / medium scale industries, traders, entrepreneurs etc. were visited and contacted / enquired about their role in enhancing potential of post harvest technologies with particular reference to the mandated crops of the Gujarat State. In this connection seven industries namely, Lion Foods Pvt. Ltd.– Shantipara, Veraval Dist – Junagadh, Manthan

Foods Products – Veraval, Dist. Junagadh, Patson Foods (India) Pvt. Ltd. – Navsari, Premcem Guar gums Pvt. Ltd.– Ahmedabad, Yogi Sharbat – Junagadh, Jagdish oil industries, Junagadh and K. J. Industries (Cumin sortex plant), Unjha were enquired for preparation of success stories.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: K. K. Jain, R. D. Dhudashia, M. N. Dabhi and A. K. Varshney

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

Visited and contacted farmers, users, traders, industries, etc. in connection with assessing the impact of different post harvest technologies developed under Junagadh centre at Junagadh, Ahmedabad, Unjha including its nearby areas. The information was compiled in the prescribed proforma. The different technologies / equipments developed by this centre included feed block making machine, cumin cleaner cum grader, coriander packaging / storage and wheat threshed by thresher and harvested by combine harvester for seed purpose storage were undertaken during this survey.

INVESTIGATION NO. 5

Project Title: Process and pilot plant for peanut milk from immature groundnut pods

Investigators: V. M. Bhatt, A. M. Joshi, K. K. Jain, D. M. Vyas, and A. K. Varshney

Objectives:

1. Process development to prepare value added products from groundnut.
2. Quality evaluation of value added products.
3. To evaluate the viability of developed process

Progress:

Two varieties, GG11 and GG20 having white bold kernels and less oil content were selected for peanut milk preparation. The cleaned and whole bold kernels were sand roasted at different temperatures (110 and 120 °C) and duration (5 and 10 min.) followed by removal of skin and the germs of kernels. The splitted kernels were soaked into NaHCO₃ solution of different concentrations (1.0 and 1.5 %) and for different duration (5 and 10 min.). Then solution was drained out and kernels were washed with plain water to remove residue particles of salt. Treated kernels were then cooked with water (in ratio 1:5 and 1:6). The cooked kernels along with hot water were then ground in the domestic grinder. The aqueous solution obtained after grinding was filtered to obtain white coloured peanut milk. Based on the sensory evaluation results, GG20 was found most suitable variety. To get good coloured, taste and flavoured milk, the kernels of GG20 should be roasted at 110 °C temp for 10 minutes while the kernels of GG11 should be roasted at 120 °C temp for 5 minutes.

INVESTIGATION NO. 6

Project Title: Storage study of wheat harvested by combine harvester and threshed by thresher

Investigators: R. D. Dhudashia, Dr. K. K. Jain, Sh. V. M. Bhatt and Sh. A.M. Joshi

Objectives:

1. To study pest population in stored wheat harvested by combine harvester and threshed by thresher.
2. To study physical and biochemical changes occurred in stored wheat during storage.

Progress:

Mechanically damaged grain was found more (3.58 to 8.36 %) in wheat harvested by combine harvester treatments as compared to thresher treatments (1.59 to 2.70%).

The percent weight loss in wheat after six months of storage was found significant and it was found higher in combine harvester treatment (3.37 to 5.15%) as compared to thresher treatment (1.13 to 2.57%).

Germination percents at storage time and after six month of storage were higher (94.10 to 95.22% and 73.32 to 80.00% respectively) in thresher wheat as compared to combine harvester wheat (92.42 to 93.22% and 59.18 to 66.99% respectively). Similarly, the vigor index was higher (212.44 to 222.96) in thresher wheat as compared to combine harvester wheat (171.90 to 191.01) after six months of storage.

Pest population buildup in wheat after 6 months of storage was found higher in combine harvester (27.35 to 43.47%) compared to thresher treatment (10.83 to 19.94%).

Considering mechanically damaged seeds, percent weight loss, germination percent, vigor index, pest population and percent grain damage, it could be inferred that wheat obtained by thresher was better for storage as compared to combine harvester.

INVESTIGATION NO. 7

Project Title: Modified atmospheric packaging of custard apple

Investigators: V. M. Bhatt, R.D. Dhudashia, A. M. Joshi, D. K. Antala, K. K. Jain

Objectives:

1. To study the effect of modified atmospheric packaging and storage on shelf life of custard apple.
2. To study the changes in biochemical quality parameters during storage.

Progress:

Custard apple fruits were stored in polyethylene bags (25 μ and 50 μ thickness) having 3 % and 6 % O₂ level, and 5 % CO₂ and stored at room temperature and at 15 °C. In the second year, the storage temperature was kept as 12 °C and 15 °C. The fruits were taken out after storage period and allowed to ripen in appropriate condition. Physical (Weight loss) and biochemical (Total sugars, Reducing sugars) observations were recorded at an interval of three days of storage. Fruits stored at low temperature (15° C) can be kept unripe for longer duration. Fruits packed in 50 μ thick polyethylene bag having 5% CO₂ and 3 % O₂ and subsequently stored at 15°C and 16°C could be kept unripe at least for 12 days; whereas the fruits kept at 12°C could not be stored and ripened because of chilling injury.

INVESTIGATION NO. 8

Project Title: Integrated pest management in coriander

Investigators: R. D. Dhudashia, K.K. Jain and A. M. Joshi

Objectives:

1. To develop IPM for control of storage pest of coriander.

Progress:

The experiment was conducted continuously for three years i.e. 2007, 2008 and 2009. Good quality well-dried coriander seeds were obtained from local market. Coriander seeds of 5 kg weight were kept for each treatment. Bags were properly packed and placed for experimentation in the laboratory and examined at an interval of one month for the incidence of pest infestation. Observations were recorded on population build up of cigarette beetle and damaged seeds up to 10 months of storage. The pest infestation was observed only in the year 2008. While no pest infestation were observed in the year 2007 and 2009. Therefore, it is proposed to continue this experiment in the year 2011.

INVESTIGATION NO. 9

Project Title: Development of onion grader and storage structure

Investigators: M. N. Dabhi, V. K. Chandegara, V. M. Bhatt, R. D. Dhudashia, K. K. Jain, and S. Singh (NHRDF-Rajkot)

Objectives:

1. To construct / modify onion storage structures.

2. To develop onion grader.
3. To grade and store the onion.
4. To study various losses during storage period

Progress:

Status report on onion storage structures was prepared and submitted. The new storage structure as per the design of Nashik type onion storage structure was constructed at departmental site. The renovation works of existing onion storage structures have also been completed. National Horticultural Research and Development Foundation, Rajkot office had supplied 40 tonnes onions for storage research. Onions were sorted out and stored in all the four storage structures viz. Traditional, Turbine air ventilated, Forced air ventilated and NHRDF, Nashik type storage structures. Physical properties of onions were measured. Sample bags for research analysis purpose were prepared and kept in the storage structures at different levels. Sensors and thermocouple wires for temperature reading in storage structures at different levels were installed and connected with data logger. Protective measures for rains were adopted using discarded gunny bags as curtains. In addition to this, observation of aspergillus niger (Black fungus) and soft rot disease were recorded at storage and sorting time. Sorting of stored onions were carried out after every one month of storage. After sorting, onions found marketable, was sold in the local market and rest of the onions having Black mould infected, Soft rot infected and sprouted onions were dumped in a pit. Hourly temperature data were recorded from data logger. The pyruvate content of onions were analysed in biochemical analysis. Observations of black fungus / soft rot disease and sprouting of onions were recorded in different storage structures during this period. The experiment is under progress.

INVESTIGATION NO. 10

Project Title: Storage study (moisture, sugar, FFA, peroxide) of Bajra flour with different packaging materials (LDPE bag 100 micron, HDPE container, Tin container, Cotton bag)

Investigators: V. M. Bhatt, A. M. Joshi, R. D. Dhudashia, and K. K. Jain

Objectives:

1. To find out the best storage condition to enhance the keeping quality of flour of Bajra varieties.
2. To study effect of storage containers and temperature on biochemical quality parameters of Bajra flour.

Progress:

The Bajra flour of 5 varieties (GHB-538, GHB-558, GHB-732, GHB-744, Desi) were stored in 4 types of storage materials (Tin container, HDPE Plastic container, Cotton bag, LDPE Plastic bag and stored at low (refrigerator) and at room temperature. Observations have been recorded at four days interval. Total storage period was 16 days. The organoleptic test was also carried out. The panel included bajra habitual persons (Bharwad community) among other members. The moisture content, FFA and malondialdehyde were analyzed and found to be maximum in flour stored in cotton bag at both temperatures. The minimum value of all three found in flour stored in tin container and plastic container stored at low temperature.

CPCRI, Kasaragod

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: T. Vidhan Singh, K. Madhavan, A.C. Mathew, T. Armughanathan

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

Training on production of coconut squash, chips, pickles & chutney powder given to 4 participants from Madikkai, Kasaragod district at APC during 13.05.09 to 16.05.09. and another similar trainings given to 8 participants from Bedadukka, Kasaragod district at during 13.07.09 to 15.07.09; 10 participants from Ajanoor and Nileshwaram, Kasaragod district during 7.12.09 to 10.12.09; and another 10 participants from Ajanoor and Nileshwaram during 12.1.10 to 15.1.10. Entrepreneurship Development Programme for women SHG for 5 members on 27.08.09. One day training programme on production of coconut chips was conducted for 3 farmers from different districts of Kerala on 10.11.09; for 11 participants of Mattanoor-Kudumbashree unit of Kannur district on 24.9.09.; for 7 participants from Mangalore on 24.11.09. Training was imparted to 10 participants from Manjeshwar block on coconut chips and copra drying on during 27-30 January, 2010.

Snow ball tender nut machine and tender nut punch and cutter was demonstrated at Kumarapuram on 27-3-2009, Kasaragod on 23-3-2009, Nileswar on 18-3-2009, Madakki on 21-3-2010 and at Minicoy on 14-1-2010

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators:**Objectives:**

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 6 technologies developed by the centre under AICRP on PHT in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Kerala state.

Investigators:**Objectives:**

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Not reported

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators:**Objectives:**

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The centre is yet to submit the Schedule 1 (to be filled by beneficiaries) and Questionnaire 2 (to be filled by PI / RE) for the technologies developed by the centre.

INVESTIGATION NO. 5

Project Title: Development of harvesting and drying equipment for Palms

Investigators: Dr. T. Vidhan Singh

Objectives:

Progress:

The shell fired chips dryer has been fabricated and testing is in progress. 200 nuts capacity shell fired copra dryer has been fabricated and is being tested.

INVESTIGATION NO. 6

Project Title: Development, Evaluation and Modification of processing gadgets/ equipments for coconut

Investigators: K Madhavan, T Vidhan Singh, T. Arumuganathan and A.C Mathew

Objectives:**Progress:****Coconut chips dryer with blower**

Performance of the dryer was quite satisfactory since heat distribution is by forced circulation and hence more uniform. The dryer was evaluated by drying coconut chips at three different drying temperatures v/z., 60, 70 and 80°C. The drying time observed was 5 hrs, 2 hrs & 30 min and 2 hrs & 15 min, respectively. Capacity of the drier was found to be 3.5 kg of coconut slice.

INVESTIGATION NO. 7

Project Title: Development of cassava and coconut (milk- extracted gratings) based food extrudates

Investigators: Dr. T. Vidhan Singh, Er. K.Madhavan &Dr. J.T. Sherif

Objectives:**Progress:**

Fermented cassava flour was prepared from fresh M4 variety cassava tubers and coconut powder was prepared. Fermented cassava and coconut powder were blended (85:15, 90:10 and 95:5) and extruded in a single screw food extruder at 180-200° C die temperature. The feed zone temperature, compression zone temperature and metering zone temperature were kept between 70-90° C. A 2mm die was used. The extruded product were tested for expansion ratio, bulk density, hardness and snap forces. It was found that the 85:5 blend was having less hardness and mores expansion ratio.and 95:5 blend was having more hardness and less expansion ratio.

AAU, Khanapara

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: R. N. Borpuzari

Objectives:

1. To establish agro-processing centres in production catchments.
2. Demonstration and transfer of post harvest technologies to the farmers/ entrepreneurs on poultry meat processing.

Progress:

The agro-processing centre is to be developed by adopting the same from Chennai centre, after its development

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: R. N. Borpuzari

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

Livestock product technologies from AAU are to be submitted.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Assam state.

Investigators: R. N. Borpuzari

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

The list of agro-processing industries established has been submitted.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators:

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

Nil

INVESTIGATION NO. 5

Project Title: Survey and documentation on traditional meat products of the north eastern region of India

Investigators:

Objectives:

Progress:

Four States of the North Eastern Region (Arunachal Pradesh, Assam, Meghalaya and Nagaland) have been covered in the survey and traditional meat products prepared by the different ethnic groups inhabiting these States were documented.

Some of the traditional meat products prepared by different tribes of the regions were collected and analyzed for physico-chemical, microbiological and sensory properties.

INVESTIGATION NO. 6

Project Title: Extension of shelf-life of broiler carcass by application of microbial biopreservative cultures

Investigators: R. N. Borpuzari and Trishna Borpuzari

Objectives:

1. To develop microbial biopreservative culture(s) suitable for extension of shelf-life of broiler carcass

Progress:

323 strains of lactic acid bacteria isolated from market samples of refrigeration stored broiler meat have been studied for their biochemical characteristics viz., their ability to ferment a variety of sugars, antibacterial activity against common human enteropathogens etc. Growth dynamics of three thermobacterial isolates namely *L. acidophilus* LA36, *L. acidophilus* LA60 and *L. delbrueckii* ssp. *bulgaricus* LA53 were determined at 0, 6, 12, 24, 48 and 72h of incubation and the total viable count was enumerated on *Lactobacillus* MRS agar plates incubating them for 72h at 37°C. 120 strains belonging to the family *Micrococcaceae* growing on Mannitol Salt Agar have been isolated. Biochemical tests have been performed to identify the generic status of the strains. Of these 120 strains isolated, 72 are found to belong to *Micrococcus* and remaining 48 to *Staphylococcus*. Antibacterial properties of the strains belonging to genus *Micrococcus* have been studied. Work on

isolation of newer strains and their characterization to facilitate final selection of suitable strain(s) is going on.

INVESTIGATION NO. 7

Project Title: Development of pig slaughterhouse with state-of-the-art technology and evaluation and demonstration of various meat processing equipment

Investigators: R. N. Borpuzari

Objectives:

1. Establishment of a modern pig slaughterhouse and evaluation and demonstration of various meat processing equipment

Progress:

A modern pig slaughterhouse is being established under the National Agricultural Innovation Project and the project is likely to be completed by November, 2010. Two training programmes have been conducted from 16th to 19th September, 2009 with 21 participants and from 5th to 9th October, 2009 with 29 participants. Meat processing instruments like meat mixer grinder, bowl chopper, sausage stuffer, cure injector, cooking vat, band saw etc. have been demonstrated. The training programmes were organized jointly with the State Institute of Rural Development, Guwahati. The art of preparing sausage, meat nuggets, meat pakoras etc. have been demonstrated.

INVESTIGATION NO. 8

Project Title: Value addition and preservation of spent chicken meat at room temperature by application of multi-hurdle technology

Investigators: R. N. Borpuzari

Objectives:

1. Study on the physico-chemical and sensory properties of the spent chicken meat and the meat emulsion prepared therefrom
2. Formulation of recipe for different chicken meat products with the incorporation of spent chicken meat, extenders and binders and application of various multi-hurdle technologies (physical, chemical and microbiological approaches) for improving the sensory (primarily tenderness and juiciness) properties of the products.
3. Analysis of the proximate composition and assessment of the physico-chemical, microbiological and sensory qualities of the products developed.
4. Determination of the keeping quality of the products at room temperature under different packaging systems and determination of the 'best before end' of the products.
5. Refinement of the technologies developed for processing of value added meat spent chicken meat products

Progress:

The technologies for production of (1) Honey Treated Deep Fried Chicken Nuggets, (2) Intermediate Spent Chicken Meat and (3) Spent Chicken Meat Pickle have been standardized.

INVESTIGATION NO. 9

Project Title: Characterization of different biogenic amines in meat and meat products and development of mitigation measure

Investigators: R. N. Borpuzari

Objectives:

1. To characterize the different biogenic amines, if any, in the smoke treated traditional meat products of the North Eastern region of India
2. To suggest suitable mitigation measures to reduce the level of biogenic amines for public health welfare of the meat consumers.

Progress:

The project will be undertaken after procurement of the ion chromatograph approved for the project.

IIT, KHARAGPUR

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: S.L. Shrivastava

Objectives:

1. To establish one new Agro-processing centre
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

The Agro Processing Centre namely 'Gramin Agro (Pvt) Ltd.', established at Jhargram is producing pressure parboiled rice for making puffed rice. In order to improve the quality of puffed rice, laboratory studies were carried out to investigate the effect of process parameters such as hot water soaking time (20-40 min), steaming pressure (1-2.5 kg/cm²) and steaming time (20-30 min) on head rice yield, color change in rice grain, hardness of rice grain and expansion ratio of rice after puffing by using response surface methodology. Paddy was soaked in hot water at 80 °C for different soaking times and subjected to different steaming pressures for different durations. Parboiled paddy was shade dried up to 12.7-12.9 % MC and then milled in abrasive type Satake polisher to 6 percent degree of polishing. Depending on the different process parameters the head yield varied from 65.5 to 72 %, total color difference varied from 8.40 to 20.38, hardness varied from 4.2 to 5.22 kg and expansion ratio varied from 4 to 5.45. Soaking time and steaming pressure were found to be the most significant factors. Head rice yield, hardness of grain and expansion ratio increased with increasing soaking time and steaming pressure. Within the experimental range studied the optimum parameters for maximum head yield, minimum color difference, maximum hardness and maximum expansion ratio were: 38 min soaking time, 1.74 kg/cm² steaming pressure and 30 min steaming time.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators:

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 5 technologies developed by the centre, in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in West Bengal state.

Investigators:

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Not reported

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators:

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT

2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The centre is yet to submit the Schedule 1 (to be filled by beneficiaries) and Questionnaire 2 (to be filled by PI / RE) for the technologies developed by the centre.

INVESTIGATION NO. 5

Project Title: Frontline demonstration of technologies, machines and products developed at IIT, Kharagpur.

1. Grain puffing machine
2. Village level milk sterilization
3. Preservation/Processing of mango, bael, cabbage, cauliflower, chilli
4. Kodo processing
5. Drum type paddy parboiler
6. Application of Bioneem and Bio-2000 for insect control
7. Technology for betel leaf oil extraction
8. Enhancing shelf life of betel leaf

Investigators: S. L. Shrivastava, P. P. Srivastav, M. N. Singh and P. Guha

Objectives:

1. To popularize appropriate post harvest technologies, machines and products

Progress:

Two-day training cum demonstration on application of Biopesticides viz Bioneem and Bio 2001 against insect pests of stored grain were organized in collaboration with MSV Laboratory Panskura on 24th May 2009 at Silda, Binpur 1 Block and 26th May 2009 at Dahijuri Binpur 2 Block of Paschim Midnapur district of West Bengal. About 150 farmers, traders and government officials attended the programme. Two-day Frontline demonstration on application of Biopesticides against insect pests of stored grain was organized in collaboration with MSV Laboratory Panskura on 26th June 2009 at Dhadika and 29th Jun 2009 at Jiankhali of Pachim Midnapur district of West Bengal. Lectures were delivered on Integrated Pest Management of Rice and System of Rice Intensification under organic skill development programme among the farmers of Pachim Midnapur district (West Bengal). About 100 farmers and government officials attended the programme.

One day Training Programme on Fruit & Vegetable Processing for the rural women was conducted. Thirteen SHG members of Midnapore Cultural & Welfare Association from Khoripara village (Village Development Programme), of Keshiary Block attended the training programme. One-day In-Plant Training Programme on Fruits & Vegetables Processing for the rural women was conducted on 09.07.2009. Forty one entrepreneurs of Daspur-I Panchayat Samity through Midnapore Cultural & Welfare Association attended the training programme.

Technologies developed at this Centre were demonstrated to large number of participants at 'Krishi, Shilp O' Banijya Mela' held at Bajkul on 9th December. Grain puffing machine along with other technologies developed at this Centre were demonstrated to large number of participants at 'Krishi Shilp, Paryatan O' Vigyan Utsav' organized by 'Sardadevi Mahila Mandal' at Baruipur during January 23 – 30, 2010. Project Coordinator, Dr S.K. Nanda, also participated in this event along with Dr S.L. Shrivastava and Dr P. Guha on January 26th and addressed the gathering. Grain puffing machine and village/home level milk sterilization along with other technologies developed at this Centre were demonstrated during a 5-day training programme organized by the Centre during February 22 – 26, 2010. A five day training on preservation of fruits and vegetables was organized at Viswa Vedic Yogashram, Uttar Mechogram, Dist. – Purba Medinipur (WB) during July, 12 – 16, 2010.

INVESTIGATION NO. 6

Project Title: Management of safe storage of pulses in West Bengal
Investigators: M.N. Singh and Ranjana Pande

Objectives:

1. To identify the major insect pests, which cause economical losses during pulse storage in West Bengal and modification of traditional storage for pulses at farm level.
2. To evaluate different storage structures against insect pests of stored pulses and to select improved structures.
3. To study physical, chemical and biocontrol methods for the control of stored insect pests of pulses and residual analysis of used bioinsecticides and fumigants in the pulses.
4. To use of plant products and different oils against insect pests of pulses.
5. Biochemical analysis of stored pulses during different control measure.

Progress:

The microwave and fluidized bed treatment are the potential method to reduce the infestation of pulses and decrease the antinutrient factor i.e. phytic acid and minimal change in colour of grain. The fluidized bed heating method which disinfests the stored grain rapidly was tested. Major insect pests of pulses belong to *Bruchidae* family which are easily disinfested by fluidized bed technology. Insect mortality for black gram and green gram grain increases with time and temperature. Complete mortality occurs at treatment with air temperature of 65-75 °C for 4 min. Percent removal of moisture at 4 min for black gram and green gram were 4.12 and 3.04%, respectively.

Green gram samples with 100% infestation were given microwave treatment at varying power level for different exposure times. The changes in moisture content, insect mortality colour difference and phytic acid were highly influenced ($p < 0.05$) by microwave power level and time of treatment. The level of microwave power and time of treatment was optimized using response surface methodology for four responses viz., moisture, insect mortality, colour and phytic acid. The optimized microwave power and time were found to be 842.1 watt and time 80 sec, respectively.

INVESTIGATION NO. 7

Project Title: Development of products of commercial importance from minor millets (Setaria, Paspalum and Panicum sp.).

Investigators: P.P. Srivastav, Geetha Ramanna

Objectives:

1. To develop flaked products from Setaria, Paspalum and Panicum sp. and examine their physical, chemical and product characteristics.
2. To develop and characterize papads using Setaria, Paspalum and Panicum sp.
3. To develop dosa idli mixes from Setaria and Panicum sp.
4. To develop extruded product from minor millet.
5. To examine economic feasibility of products developed.

Progress:

Kodo millet and chickpea flour blend was studied for extrudability to see if kodo millet (without other starch source like rice) gives good extrudates in combination with chickpea flour. Increase in temperature and screw speed resulted in extrudates with higher expansion ratio and crispiness, whereas increase in feed rate had negative effect on them. Lower bulk density and hardness was recorded at higher temperature, screw speed and lower feeder rpm. To obtain the extrudates with best physical attributes, process was optimized and good quality extrudates were obtained at 150 °C, screw speed of 300 rpm, and feeder rpm of 15 rpm recording expansion ratio of 3.88, bulk density 0.18 g cm⁻³, hardness 9.44 N, and crispiness as 16 positive peaks.

Extrusion cooking of millet with different fiber sources including fruits and vegetables like cucumber peel, fenugreek leaves, sweet lime pulp, rice bran was also studied. Composite flour of kodo, green gram and fiber source was prepared with 70:20:10 ratio and extrusion cooking was done at 120°C, 250 rpm screw speed, feeder speed-25rpm. Crude fiber content in the extrudates had low values since fiber might have formed complexes with other

polymers of the composite flour and thus was unextractable with the method used. Extrudates prepared from kodo, green gram and cucumber peel and also extrudates of sweet lime were acceptable but extrudates prepared using methi as fiber source were bitter, and bran as fiber source had branny odour.

INVESTIGATION NO. 8

Project Title: Production of Spirulina powder and extraction of nutraceuticals

Investigators: P. P. Srivastav, H. N. Mishra and Suresh Prasad

Objectives:

1. To standardize growth condition(s) of selected Spirulina species for the maximum yield of biomass and nutraceuticals.
2. To develop a system for maximum extraction of nutraceuticals from biomass
3. To develop a suitable product from biomass
4. To study the techno-economic feasibility and transfer technology of the developed system among rural artisans and unemployed youth

Progress:

Optimization of multi factors at a time on better biomass and protein yield of Spirulina platensis var lonor was studied using Response surface methodology. The Sodium nitrate (NaNO₃), Magnesium Sulphate (MgSO₄), Calcium Chloride (CaCl₂) and pH were having significant effect on both biomass and protein yield. The maximum content of biomass (1.29 g/L) and protein (57.95 %) were obtained with the CFTRI medium having NaNO₃ 2.25 g/L, MgSO₄ 0.50 g/L, CaCl₂ 0.02 g/L and pH-10.1. A RTS health drink was prepared using the extracts of Spirulina biomass with common ingredients which includes 0.1% table salt, 20% table sugar, 0.25% citric acid, 0.05 % sodium benzoate and 0.02 ml of pine apple flavor. The developed product showed better sensory properties.

INVESTIGATION NO. 9

Project Title: Management of safe storage of spices in humid hot region of West Bengal.

Investigators: M.N. Singh and Ranjana Pande

Objectives:

1. To evaluate different traditional and improved storage structures for safe storage of spices
2. To evaluate the effect of different packaging materials viz Gunny Bag, HPD Sack, Polythene Bag and Polythene Impregnated Bag on the storability of whole chilies, turmeric and coriander
3. Physical and chemical control of insect pests of spices

Progress:

The effect of different concentrations and doses of different insecticides and fumigants against insect pests of coriander seed were studied. Insect pests generally observed in coriander seed include *Aræcerus fasciculatus*, *Teneboides mauritanicus*, *Lasioderma serricorn* and *Trogoderma granarium*. By treatment with 0.5 % concentration of Malathion 50 % EC, no residue of respective active ingredient was traced after 4th days of aeration and with 2.0 % concentration, residue of active ingredient was traced to be 0.0004 ppm in coriander seed. Treatment with 2g/t dose of aluminum phosphide, no residue of active ingredient was traced after aeration. However, with 8g/t doses, the residues of active ingredient were traced 0.0003 ppm in coriander seed. There were no residues of respective active ingredient were traced in Bio-neem, Boi 2001, Carbon Tetrochlorides and Ethylene Dichloride after 4th days of aeration. All these residual values were within the tolerance limit. As a whole all the insecticides and fumigants applied provided good response in controlling the insect population of stored coriander seed. Taking into consideration all the criteria the following insecticides and fumigants in descending order of preference can be used for the effective control of insect pest complex of stored coriander seed.

INVESTIGATION NO. 10

Project Title: Development of Cashew nut Sheller, Peeler and Grader as Integrated System for Cashewnut Processing.

Investigators: S. L. Shrivastava, Soumitra Banerjee

Objectives:

1. To design and develop an integrated system of cashewnut roaster, sheller, peeler and grader.
2. To study the performance of the developed system in the laboratory.
3. To conduct long-run test trials on the developed system for assessing the longevity of its working components.
4. To study the techno-economic feasibility of the system.
5. To transfer the developed technology to the potential users.

Progress:

Microwave, infrared, hot air oven and steam treatments were studied cashew nuts shelling with centrifugal sheller. Steam treatment yielded maximum whole kernel recovery as well as maximum gap generated between kernel and the shell. The optimized treatment was found to be 1.75 Kg/cm² steam pressure, 43.3 min exposure time and sheller speed of 1560 rpm. The estimated shelling efficiency, whole kernel yield and broken kernel yield were 89.18, 49.27 and 48.74 percent, respectively. The operational cost of centrifugal cashew nut sheller was substantially low at Rs. 0.40/kg as compared to manual shelling cost of Rs. 6.60/kg. Existing pre-conditioning method for Cashew Kernel Peeling by hot air drying (70 °C for 6 hr) was replaced by steaming (atmospheric pressure) for 40 min then drying in microwave oven (900W) for 1 min 40 sec. Due to alternate moistening and drying, there was uneven expansion and contraction in the kernel which caused gap formation in the kernel. Peeling of cashew kernel was studied with a system of rubber rolls, rotating in opposite directions at different speeds and the operating parameters were optimized. The peeling efficiency was found to be 70.48% at a speed of 42 RPM and clearance of 8.6 mm. The capacity of rubber roll peeler was found to be 442 kg/ hour. The cashew kernels obtained with rubber roller had sensory qualities similar to that of market available cashew kernels. Techno-economic feasibility analysis revealed that the developed system yielded an additional net profit of 12.40 per kg over the existing method.

INVESTIGATION NO. 11

Project Title: Development of technology for enhancing shelf life of onion (*Allium cepa* L.) in hot and humid region of West Bengal

Investigators: P. Guha

Objectives:

1. To estimate the different types of losses in onion during storage
2. Screening of chemicals for enhancing shelf life of onion to find out the best one
3. Screening of physical agents for enhancing she life of onion to find out the best one
4. Screening of varieties with long shelf life.

Progress:

Major wholesale markets of onion in Kolkata have been surveyed for assessing the normal storage requirement as well as extent and type of losses during storage.

RSJRS, KOLHAPUR

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators:

D.S. Patil (Upto 11.11.2009), B.G. Gaikwad (From 12.11.2009), G.S. Nevkar
S.M. More, V.N. Nale (Upto 29.01.2009), U.S. Kudatarkar (From 30.01.2009)

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

Not reported.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators:

D.S. Patil (Upto 11.11.2009), B.G. Gaikawad (From 12.11.2009), G.S. Nevkar
S.M. More, V.N. Nale (Upto 29.01.2009), U.S. Kudatarkar (From 30.01.2009)

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 9 technologies developed by the centre under AICRP on PHT and on 6 technologies developed by the university, in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Maharashtra state.

Investigators:

D.S. Patil (Upto 11.11.2009), B.G. Gaikawad (From 12.11.2009), G.S. Nevkar
S.M. More, V.N. Nale (Upto 29.01.2009), U.S. Kudatarkar (From 30.01.2009)

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Not reported.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators:**Objectives:**

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The centre is yet to submit the Schedule 1 (to be filled by beneficiaries) and Questionnaire 2 (to be filled by PI / RE) for the technologies developed by the centre.

INVESTIGATION NO. 5

Project Title: Effect of size and packaging on storability of jaggery powder

Investigators:

D.S. Patil (Upto 11.11.2009), B.G. Gaikawad (From 12.11.2009), G.S. Nevkar
S.M. More, V.N. Nale (Upto 29.01.2009), U.S. Kudatarkar (From 30.01.2009)

Objectives:

1. To study the effect of powder size and packaging on storability
2. To assess the quality of stored jaggery powder

Progress:

Jaggery powder prepared in three sizes viz; Fine (1mm) , Medium (2 mm) and coarse (3mm) were packed in five different packaging material as per treatment .The quality of jaggery powder was analyzed after storage period of six months. Based on pooled data, the three-ply (PE-Al-PET) packaging material was found suitable for storability of jaggery powder followed by 300 gauge packing. However considering the lower cost (Rs 0.92 per kg)of packaging, the 300 gauge packing material could be the most suitable packing material for jaggery powder. The coarse size (3 mm) of jaggery powder was found better for long term storage.

INVESTIGATION NO. 6

Project Title: Standardization of mechanical method of settling of liquid jaggery

Investigators:

D.S. Patil (Upto 11.11.2009), B.G. Gaikawad (From 12.11.2009), G.S. Nevkar
S.M. More, V.N. Nale (Upto 29.01.2009), U.S. Kudatarkar (From 30.01.2009)

Objectives:

1. To study the effect of different speed and duration of centrifuge machine for settling of liquid jaggery.
2. To study the effect of mechanical settling on keeping quality of liquid jaggery

Progress:

After centrifugation of liquid jaggery for different speed and periods as per treatments and subsequent removal of light and heavy impurities , the liquid jaggery samples were kept storage for the period of one year the bimonthly observations on quality parameters of liquid jaggery were recorded. From the pooled results it is recommended that for faster settling of liquid jaggery ,to avoid accumulation of impurities and to maintain quality of liquid jaggery during storage the liquid jaggery should be centrifuged at 8000 rpm for 5 minutes period.

INVESTIGATION NO. 7

Project Title: Optimization of boiling pan size for quality jaggery

Investigators:

D.S. Patil (Upto 11.11.2009), B.G. Gaikawad (From 12.11.2009), G.S. Nevkar
S.M. More, V.N. Nale (Upto 29.01.2009), U.S. Kudatarkar (From 30.01.2009)

Objectives:

1. To study different sizes of boiling pan and juice volume in boiling pan during jaggery processing.
2. To identify appropriate size of boiling pan and juice volume for jaggery quality, time and fuel saving during jaggery processing.

Progress:

Considering the data on lowest jaggery process time, lowest bagasse (fuel) utilization, highest fuel use efficiency during jaggery production process and quality of jaggery produced, the optimum size of boiling pan size and juice volume is recommended to be 10' 6" (BD) and 1000 litres, respectively.

INVESTIGATION NO. 8

Project Title: Production of organic jaggery (planting to processing)

Investigators:

D.S. Patil (Upto 11.11.2009), B.G. Gaikawad (From 12.11.2009), G.S. Nevkar
S.M. More, V.N. Nale (Upto 29.01.2009), U.S. Kudatarkar (From 30.01.2009)

Objectives:

1. To study the effect of organic farming on juice and jaggery quality

Progress:

For this study, the released sugarcane variety Co 86032 was cultivated through organics and through inorganics. The jaggery samples prepared from the sugarcane treatment which consist of application of 25 % RD through organics and 75% RD through inorganic showed the keeping quality better as compared to rest of the treatments. The

treatment of organic jaggery production using citric acid as a source of organic acid was found most superior amongst organic jaggery production treatments.

INVESTIGATION NO. 9

Project Title: Effect of anticaking agent (calcium carbonate, silicon dioxide, sodium silicate and maltodextrin) on free flowing nature of jaggery powder

Investigators:

D.S. Patil (Upto 11.11.2009), B.G. Gaikwad (From 12.11.2009), G.S. Nevkar
S.M. More, V.N. Nale (Upto 29.01.2009), U.S. Kudatarkar (From 30.01.2009)

Objectives:

1. To study the effect of anticaking agent on the free flowing nature of jaggery powder during storage
2. To study the effect of anticaking agent on quality of jaggery powder

Progress:

Powder jaggery was prepared scientifically, dried in shade and sieved into three sizes. The anticaking agents, viz. 1. Calcium carbonate 2. Silicon dioxide 3. Sodium silicate and 4. Maltodextrin (permitted as per Prevention Food Adulteration Act -1954) were separately mixed in jaggery powder as per treatments, packed into 300 gauge polythene bags and stored up to one year for quality and texture analysis.

The anticaking agent maltodextrin was found to be superior in respect of lowest moisture content (2.22 %) and higher NRS (78.47 %). The application rate of anticaking agent @ 1.00 % was found satisfactory Jaggery powder of coarse size was found superior in quality and organoleptic sensory evaluation.

INVESTIGATION NO. 10

Project Title: Standardization and commercialization of organic clarificant for sugarcane juice in jaggery manufacturing

Investigators:

D.S. Patil (Upto 11.11.2009), B.G. Gaikwad (From 12.11.2009), G.S. Nevkar
S.M. More, V.N. Nale (Upto 29.01.2009), U.S. Kudatarkar (From 30.01.2009)

Objectives:

Progress:

Some of the organic clarificants are identified viz., Edible gum (Acacia spp.), Aloe vera pulp/ juice, Isabgol (Psyllium) seed husk, Maize flour, Wheat flour, Black gram flour and Tapioca flour. These organic clarificants will be tested for its clarification efficiency during jaggery preparation. Each clarificant will be tested for its effect on sugarcane juice clarification efficiency as well as jaggery quality. Application method and rate will be then standardized. Sugarcane variety Co 92005 will be utilized for jaggery production by adopting scientific method of jaggery making. Jaggery samples will be analyzed initially as well as after storage for physical and chemical parameters by adopting standard analytical method.

WBUA&FS, Kolkata

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators:

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

This project has not been taken up.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: S. Sarkar, S. Chowdhury, P.R. Das and D. Sutradhar

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 4 technologies developed by WBUA&FS and 4 livestock based commercially available technologies from reputed private firms, in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in West Bengal state.

Investigators: S. Sarkar, S. Chowdhury, P.R. Das and D. Sutradhar

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Success stories of 3 no. of agro-processing industries in the state were compiled and submitted.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: S. Sarkar, S. Chowdhury, P.R. Das and D. Sutradhar

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

Four technologies are ready to be commercialized and their probable impact is being assessed. The centre is yet to submit the Schedule 1 (to be filled by beneficiaries) and Questionnaire 2 (to be filled by PI / RE) for the technologies developed by the centre.

INVESTIGATION NO. 5

Project Title: Manufacture and preservation of ready-to-cook & ready-to-eat fishery products prepared from low value fish.

Investigators: Sreekanta Sarkar, and Supratim Chowdhury

Objectives:

1. Preparation of ready to fry fish/shrimp papad from low value fish/shrimp

Progress:

Process for production of shrimp papad and fish papad were standardized. Shrimp / Fish flour was incorporated up to 20% in standard recipe for papads..

INVESTIGATION NO.6

Project Title: Use of different multilayer plastic packaging materials for determining the self life of extruded fishery products.

Investigators: Sreekanta Sarkar, and Supratim Chowdhury

Objectives:**Progress:**

The extruded product developed absorbs moisture and needs to be package on site. The packaging machine is being procured.

INVESTIGATION NO.7

Project Title: Standardization of extraction process for seafood flavourants from shrimp and manufacture of imitation products using mince meat.

Investigators: Sreekanta Sarkar, and Supratim Chowdhury

Objectives:

1. Extraction of shrimp flavour from shrimp waste
2. Its incorporation in imitates products like soup powder

Progress:

Comparative studies were carried out between raw shrimp waste and fresh shrimp meat where a remarkable amount of protein (13.5%) was found compared to fresh shrimp meat (20.07%). The storage life studies showed that shrimp head and meat have a shelf life of around 8-10 days when stored at 0°C. The shelf-life was reduced to around 4-5 days at 4°C storage temperature. At lower storage temperature of -4°C and -18°C, they were found within the acceptable limit after 10 days storage. The optimized method of extraction of the shrimp flavour was by boiling with 3% starch and 3% salt with 0.5% MSG. Process to manufacture imitation product (soup powder) using extracted shrimp flavour has been developed.

INVESTIGATION NO.8

Project Title: Efficacy of solar drier for salted fish. (White sardine)

Investigators: Sreekanta Sarkar, Supratim Chowdhury, and Miss M. Bhargavi

Objectives:

1. To study the effect of brining, pressing and drying on the qualities of white sardine.
2. To study the effect of drying methods on the quality and shelf life of white sardines at room temperature.

Progress:

Brine concentration (prior to drying) was standardized (24 hours, 15%) on the basis of lower moisture content, lower bacterial load and better organoleptic quality, for White sardine (*Escualosa thoracata*) fish collected from Digha fish landing centre. Sun drying and solar drying (Cabinet type of solar drier from Society for Energy, Environment and Development, Hyderabad) of brined fish, pressed and without pressing the product, were compared. Solar dried samples (3 days) were in acceptable condition up to 90 days on the basis of moisture content, colour and microbial analysis.

INVESTIGATION NO.9

Project Title: Utilization of Shrimp waste for preparation of chitosan derivatives for preservation of fish.

Investigators: Sreekanta Sarkar, Mr. Supratim Chowdhury

Objectives:

1. Assessment of physico-chemical characteristics of chitosan dipped peeled shrimps.
2. Effect of antimicrobial activity of chitosan in extension of shelf life of peeled shrimps.

Progress:

Physical, chemical, microbial and sensory parameters were analyzed (after dipping and storage). Shelf-life of *P. monodon* with 1% acetic acid + 1% chitosan coating was 10 days whereas shelf-life of *P. monodon* with 1% acetic acid coating could not go beyond 3 days. Shrimp head, a by-product of the processing plants, was formulated to form a feed (comparable nutrient profile as fish meal, lower cost; can aid in the sanitization of the environment from the dumping of the waste shrimp head from the processing plants). Biologically ensiled shrimp head silage meal can effectively replace fish meal up to 30% in the diet of the Indian major carp *Cirrhinus mrigala* fry.

INVESTIGATION NO.10

Project Title: Development and demonstration of model retail outlet for live fishes and seafood.

Investigators:

Objectives:

Progress:

Project is yet to be started.

INVESTIGATION NO.11

Project Title: Assessment of selected heat absorbent materials (dry ice and thermal gel) in maintenance of cold chain in fish distribution

Investigators: Sreekanta Sarkar, Mr. Supratim Chowdhury

Objectives:

1. Standardization of gel ice pack.
2. To compare the temperature graph under model conditions for Gel pack and Wet ice.
3. To evaluate the storage life of Pomfret with Gel packs.

Progress:

A suitable gel ice pack was developed for preservation of fish particularly during air transportation using a mixture of isopropanol and water at varying ratios. The best combination of isopropanol and water was then selected based on preliminary trials and used for storage study to enhance shelf life on pomfret up to 5 days. Trials are being conducted to standardize the concept.

I I S R, LUCKNOW

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: Jaswant Singh , R.D.Singh and SI Anwar

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

To select a suitable client, 5 farmers were contacted and negotiation was done for establishing the APC on Jaggery. The process for making the committee for finalizing the farmer client is in progress. Proposal for training and demonstration has been prepared as per the proforma supplied and submitted for approval.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: Jaswant Singh , R.D.Singh and SI Anwar

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 10 technologies developed by the centre under AICRP on PHT in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Uttar Pradesh state.

Investigators: Jaswant Singh , R.D.Singh and SI Anwar

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Information is being collected by the centre.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: Jaswant Singh , and R.D.Singh

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The centre has submitted the Schedule 1 (to be filled by beneficiaries) for one technology developed by the centre.

INVESTIGATION NO. 5

Project Title: Development of mechanical juice filtration unit (800 lph)

Investigators: R.D.Singh and Dilip Kumar

Objectives:

1. To develop a mechanical filtration unit
2. To evaluate the unit

Progress:

A mechanical filtration unit for filtration of sugarcane juice developed, tested and evaluated. The unit consists of a pre-filter and four filters in series. A pump of 800 l/h (operated with 12 watt power supply) was used for pumping the juice. The filtration efficiency and capacity were found as 80.00 % and 300 l/h respectively.

INVESTIGATION NO. 6

Project Title: Value addition of jaggery through natural source of vitamin C

Investigators: S.I. Anwar and R.D.Singh

Objectives:

1. To identify natural source of vitamin C suitable for value addition
2. Process development for value addition
3. Standardization of process

Progress:

Indian gooseberry (*Aonla*) in identified quantity and form was successfully added in jaggery in its process of manufacture enriching jaggery with vitamin C (75.4 mg/100 g). Storability of samples over a period of six months showed retention of vitamin C in substantial quantity (72 mg/100 g). Thus the concept can be utilized for manufacture of more nutritious jaggery, which may become a part of mid-day meal being given to rural school going children. With this value-added jaggery cubes and bars can be prepared. Bar shape is suitable for individual packaging whereas cube shape is suitable for making 250 g, 500 g or 1 kg packs. Samples showed storability at par with plain jaggery.

INVESTIGATION NO. 7

Project Title: Design and development of sugarcane peeler

Investigators: Dilip Kumar, Jaswant Singh and P.R. Singh

Objectives:

1. To develop an abrasive sugarcane peeler
2. To evaluate the equipment for peeling sugarcane

Progress:

Three type of peeling units, namely gear type, helix type and saw tooth type, were designed and based on performance, saw tooth type peeling unit was selected for further development. The peeling unit was driven by an electric 0.25 bhp electric motor through belt and pulley. The whole unit was mounted on a rectangular frame. The unit worked satisfactorily with 85% peeling efficiency. The capacity of the unit was found as 100kg/h

INVESTIGATION NO. 8

Project Title: Development of a small capacity cane crushing unit (0.25 hp) for household purpose

Investigators: Jaswant Singh , R.D.Singh and SI Anwar

Objectives:

1. To develop a small capacity cane crushing unit
2. To test and evaluate the developed unit

Progress:

A compact and closed mini cane crusher has been developed for household use, driven by 0.25 hp motor through sprocket chain transmission system. The crushing unit consisting of three horizontal crushing rollers (king, feed, and extraction), in counter-rotating fashion, a guide, power transmission system, sugarcane entry and bagasse exit port and framing plate in rectangular shape and an electric motor has been developed. Testing of the unit will be done in the forth-coming crushing season.

INVESTIGATION NO. 9

Project Title: Development of a device for churning of sugarcane juice in an open pan furnace

Investigators: Jaswant Singh and A. K. Singh

Objectives:

1. To design and develop a suitable churning device
2. To test and evaluate the performance of churning device

Progress:

Out of the two types of rotary systems ie vertical rotor in horizontal plane and horizontal rotor in vertical plane, developed for de-frothing and mixing of juice in the open pans of the triple pan furnace, the rotary system in vertical plane was tested and evaluated. It worked satisfactorily at the rotor speed of 06-08 rpm in the open pan filled with 150-200 litres of cane juice.

INVESTIGATION NO. 10

Project Title: Optimization of fins provided to the pan bottom for improved efficiency of jaggery/khandsari

Investigators: SI Anwar

Objectives:

1. Optimization of fins in relation to size, spacing and percent increase in area of heat receiving surface.
2. Fabrication of optimized pan and its testing
3. Modification in furnace design and operating parameters, if required based on test results.

Progress:

The experimental results with smaller pans showed that efficiency of furnace increases with increase in area of heat receiving surface by virtue of fins. For the same increase in area of heat receiving surface, smaller but more number fins are better choice over lesser number of larger fins.

INVESTIGATION NO. 11

Project Title: Refinement of 3-roller P.D. horizontal sugarcane crusher developed at IISR, Lucknow

Investigators: S.I. Anwar and Jaswant Singh

Objectives:

1. Refinement of P.D. horizontal sugarcane crusher developed at IISR Lucknow
2. To make crusher suitable for actual operating conditions.

Progress:

The rollers of crusher were modified and fitted. The thickness of collar of king roller was increased to 25 mm with 35 mm depth. Accordingly, size of other two rollers was reduced for accommodating modified king roller. All old bushes were replaced by new ones. Testing of crusher showed juice extraction of 56 per cent (cane basis) on crushing capacity of 412 kg/h.

INVESTIGATION NO. 12

Project Title: Development of a solar drier for jaggery drying (100 kg/batch capacity)

Investigators: Jaswant Singh, R.D. Singh and Dilip Kumar

Objectives:

1. Design and development of a solar drier
2. Testing of the developed drier

Progress:

A 100 kg jaggery cube solar dryer was designed and fabricated. It consists of wooden drying chamber with double staked trays and provisions for intake of ambient air, radiation trapping glass, chimney and a metallic frame. The testing of this dryer will be done in next crushing season.

INVESTIGATION NO. 13

Project Title: Testing and evaluation of IISR jaggery drier

Investigators: A. K. Singh, Jaswant Singh and R. D. Singh

Objectives:

1. To test the efficacy of drier for drying of jaggery.
2. To study the feasibility of drier for drying other commodities.
3. To evaluate the storability of dried jaggery.

Progress:

The drier was tested for drying of fresh jaggery. The moisture content of jaggery on dry basis was reduced from 13.5% to 7.8% after 9 hours of intermittent drying. During the entire drying period the rate of drying falls under falling drying rate periods. Rate of drying (reduction in moisture content on dry basis, % per unit time) decreased with the increase in the drying time. The dried jaggery was stored for six months. The quality parameters viz; sucrose, reducing sugar and colour readings were found at par with the natural dried jaggery. The feasibility study revealed that the dryer was suitable for drying of grapes and chillies also.

INVESTIGATION NO. 14

Project Title: Evaluation of shrink wrap, stretch wrap and modified atmosphere packaging for storage of jaggery cubes and blocks

Investigators: R.D. Singh, Jaswant Singh, S.I. Anwar

Objectives:

1. Evaluation of shrink-wrap, stretch wrap and modified atmosphere packaging for storage jaggery cubes and blocks

Progress:

Initial reading of quality parameters (moisture, colour brix, and pol) of the cube shape jaggery samples were measured. The sample have been packed in the different packaging conditions.

PAU, LUDHIANA

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: V K Sehgal, M S Alam, Maninder Arora, T C Mittal

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

Three new APCs in different villages have been established under our guidance/supervision. These newly established agro-processing complexes at 'Lopon', Tehsil Samrala, 'Mahla', Tehsil Bagha Purana and 'Kot Sukhian', District Faridkot, were also given the hygiene and sanitation guidelines. Installation of exhaust fans, dust collectors, air purifiers, use of face mask, safe practices of agro-processing, HACCP concept, with maintenance of sanitary conditions in the premises were suggested to the owners. To save the operators/workers from hearing hazards, the use of personal protective equipments like plugs and muffs were recommended. Five farmers are in the process of establishing APCs in their respective villages. All these complexes comprised of a mini rice mill, baby oil expeller, atta chakki (rajasthani), and flour mill and masala grinder. Three already established APCs were also monitored. There is no machinery and product management problem in all these APCs. All these complexes were found to be economically viable units, providing employment to 2-4 persons. Twenty farmers were guided for establishment of various Agro Processing Complexes. Ten lectures and demonstrations were given in different training programs.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: V K Sehgal, T C Mittal, M S Alam, Surekha Bhatia

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The directory of proven post harvest technologies, equipments/manufacturers of various post harvest equipments/technologies developed in Punjab was prepared after collecting the desired information.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Punjab state.

Investigators: M S Alam, T C Mittal, V K Sehgal

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

The questionnaire was distributed to the entrepreneurs in various districts of Punjab for gathering the required information. Total 171 Agro processing complexes were visited and the information was collected and compiled. Success stories of 10 agro processing complexes were developed

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: V K Sehgal, Maninder Arora, D.K. Sharma, S R Sharma and Surekha Bhatia

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The agro- complexes have been adopted by the farmer/entrepreneurs at various places in Punjab through the various extension activities viz. trainings, lectures, TV talks etc. More than 400 agro processing complexes have been established. Depending on the initial investment varying from Rs 80,000 to 8,00,000, an agro processing complex gives a monthly profit of Rs 5000-35,000/- . Farm level fruit and vegetable washing machine was adopted to replaced the prevalent practice of washing, which involves drudgery and unhygienic conditions. Total ten units of was sold so far. Turmeric washer and polisher has been approved by Research Evaluation Committee, PAU for publication in Package of Practices and has been commercialized. Demonstration of Turmeric Washing-cum-Polishing machine was successfully carried out at four different places, to about 700 farmers in these two years. Electric-cum-battery heated wax uncapping knife has been tested, evaluated and approved by the Research Evaluation Committee, PAU for its adaptive trials. Based on the positive feedback regarding Honey Uncapping Knife distributed to the Beekeepers last year, 20 more prototypes of uncapping knives were got fabricated during 2009-10 and further distributed and demonstrated to various Beekeepers in different locations of Punjab.

INVESTIGATION NO. 5

Project Title: Process development for improvement in rice milling through enzymatic pretreatment

Investigators: Maninder Arora, V K Sehgal, Surekha Bhatia

Objectives:

1. Production of cellulase, xylanase and protease enzymes by submerged Fermentation.
2. Extraction and purification of the enzymes and use of partially purified enzymes for hydrolysis of rice bran layer.
3. Evaluation of milling characteristics and quality of enzymatically pretreated polished rice and its comparison with untreated mechanically polished rice.

Progress:

Enzymatic pretreatment prior to mechanical polishing enhanced the milling performance of both Basmati 370 as well as that of Pusa 44. It resulted in an increase of head rice yield by an average of 4.5%, lowering of the percent brokens by 2% and resulted in decrease of polishing time by 35 sec for both the varieties. This treatment also improved the cooking characteristics, as it led to a reduction in optimal cooking time of the polished rice by 5.5 min. and a reduction of moisture content by 4% in the treated samples. For large scale production of microbial enzymes, a solid state fermenter has been designed, fabricated and evaluated. Effect of different cultural conditions on enzymes production in a tray type fermenter (with temperature and humidity control) was done using rice straw as the substrate. This fermenter can ferment 10kg of rice straw(wet wt.) to produce 250g of enzymes in one batch, which is sufficient to pretreat brown rice obtained from 10 tonnes of paddy. The cultural conditions exerted a significant impact on enzyme production. The optimized conditions for maximum cellulase and xylanase production were temperature 29.97°C, pH of medium 5.44, incubation time of 4.21 days and inoculum concentration of 2.13×10^7 spores. The technology is ready for dissemination to the rice millers.

INVESTIGATION NO. 6

Project Title: Development of strategies and techniques for the control of stored grain insects/ pests/ microflora/ mycotoxin in Bengal gram

Investigators: D K Sharma, M S Alam, Surekha Bhatia

Objectives:

1. To evaluate the effect of Turmeric powder and Neem leaf powder as grain protectants against *Collosobruchus* sp.
2. To evaluate the effect of thermal treatment with different Time- Temp. combinations.
3. To select the optimum gauge and perforations of packaging material i.e. LDPE for storage of Bengal gram.
4. To assess the quality attributes of stored Bengal gram.

Progress:

The effect of turmeric powder, neem leaf powder and thermal treatments as grain protectants against Pulse beetle on Bengal gram were evaluated in the laboratory. The thermal effect was thoroughly studied against all the life stages (egg, larva, pupa and adult) of pulse beetle and it was established that 60°/70° C temperature were most effective and a cent-per cent mortality was achieved when grains were exposed for 20, 40 and 60 minutes. Thus no adult emergence took place at these temperatures and time combinations. These temperatures effectively killed all the life stages of pulse beetle when exposed separately. Both the plant products (Turmeric and Neem) failed to curtail the egg laying, possibly due to their non proper retention on the grains. The plant products incorporating with the mustard oil @ 6 ml/kg grains helped in improving the retention of these plant powders on the grains and controlling the egg laying on the treated grains.

INVESTIGATION NO. 7

Project Title: Replacement of existing hook system (kundi) for minimizing the pilferage losses during handling / lifting of bags in markets/warehouses/godowns

Investigators: D K Sharma, T C Mittal, V K Sehgal, M S Alam

Objectives:

1. Grain bag lifting/handling system free of drudgery and losses

Progress:

Different mandis/warehouses of Punjab were surveyed to see the use of hooks for lifting and transportation of bags and to explore for their alternatives, if possible. It was observed that practically there is no substitute of the hooks used for lifting the grain bags in mandis / warehouses. The hooks (4.5 mm and 6 mm thickness) made from spring steel material (with carbon content 0.75 -0.85%) showed the required tensile as well as elongation properties for withstanding the impact load experienced during lifting and unloading operations.

INVESTIGATION NO. 8

Project Title: Development and evaluation of equipments and technologies for honey extraction

Investigators: V K Sehgal, M S Alam, DK Sharma, M. Arora, Surekha Bhatia

Objectives:

1. To design and fabricate new/or improved honey production and processing equipment/system.
2. To evaluate the performance of developed honey production and processing equipment/systems.
3. To study the effect of filtration system on honey storability in different types of storage containers.

Progress:

Twenty prototypes of honey uncapping knife were fabricated and tested for its performance in the laboratory and Beekeepers Apiaries. A fully mechanized Honey Filtration Unit with separate heating and filtration arrangements with two separate sensors for sensing and controlling the temperature of heating water and honey in the main chamber was

developed. The unit was evaluated in the laboratory for its performance at different process conditions (25 kg capacity at 60°C temperature with 20 min. holding time; 50 kg capacity at 50°C temperature with 40 min. holding time). The optimum capacity was 50 kg of raw honey with total time (heating & filtration) requirement of 99 minutes and 148 minutes, respectively. The honey processed through new modified honey unit was compared with raw honey as well as commercially processed honey for its microbiological and biochemical quality attributes viz., reducing sugars, moisture content, acidity (formic acid%), pH and total soluble sugars. It was observed that the process of filtering reduces or eliminates many microbes. The microbiological quality of honey filtered through the developed filtration system was better than that of raw honey as well as commercially processed honey. No significant difference in biochemical quality attributes viz., reducing sugars, moisture content, acidity (formic acid %), pH and total soluble sugars was found in commercially processed honey and honey processed through modified honey unit. However, honey processed through new modified honey unit had less acidity and more reducing sugars as compared to raw honey.

INVESTIGATION NO. 9

Project Title: Enhancement of shelf life improvement of tomatoes using edible coating and packaging

Investigators: Surekha Bhatia, M S Alam, Maninder Arora, V K Sehgal

Objectives:

1. To study the effect of diffusion barriers on shelf life of tomato.
2. To select the best combination of coating concentration and packaging Perforation in relation to quality parameters

Progress:

Three types of edible coating viz. cellulose, pectin and starch were formulated and tested for its application on tomatoes for increasing shelf life of tomatoes. The red tomatoes were coated with edible coatings were placed in open trays, low-density polyethylene bags having 0, 2 and 4 perforations and were stored at ambient and refrigerated conditions. Samples were analyzed for post harvest quality changes i.e , Physiological loss in weight , pH , firmness, color ,TSS, titrable acidity ,ascorbic acid, lycopene, reducing sugars, enzyme polygalacturonase , percent decay at regular intervals. Based on selected quality parameters observed at regular intervals, it was found that tomatoes coated with pectin and packed in LDPE bags with 4 perforations increased the shelf life of tomatoes by 3 days under ambient condition and by 28 days under refrigerated condition.

INVESTIGATION NO. 10

Project Title: Pilot plant facility for production of intermediate moisture product from plum fruit

Investigators:

Objectives:

Progress:

Not reported.

KVA&FSU, MANGALORE

INVESTIGATION NO. 1

Project Title: Shelf-life enhancement of fish sausage in natural casing by using identified natural preservatives

Investigators: C.V. Raju, and Lakshmisha I.P.

Objectives:

1. To find out an alternative method of preservation for fish sausages through smoking, use of natural colors and preservatives.
2. Standardization of different operations in the preparation of ready-to-serve heat processed fish mince based products.
3. Use of different metabolites of bacteria like nisin, colicin and pediocin at different concentration in the preparation of fish sausage in natural casings.

4. Assessing the effectiveness of added metabolites and its stability in their products during storage temperature.
5. Standardization of recipe for fish sausage by using different ingredients
6. To study the suitability of natural coloring materials like chilly and turmeric as substitute for coal tar dyes such as carmosine and ponceau 4R
7. To find out whether the effect of smoking increases the product attractiveness and other sensory characteristics.
8. To study storage stability of smoked, preservative treated products stored at refrigerated (0 to 5 °C).

Progress:

Sausage casings are made by natural sources like gastrointestinal tract of cattle, sheep, and goat etc., which are major by-products of the abattoir industry. For our present study, intestines of Sheep were procured, and cleansed. Threadfin breams fish were dressed, washed and subjected to picking and mincing. Fish paste was stuffed into processed natural casing using manual hand stuffer. Sausage were prepared with 70% minced meat and other ingredients.

Temperature and time were also standardized (80 °C and 90 minutes) for preparation of smoked fish sausage. A batch of fish sausage in natural casing was also attempted for thermal processing in tin containers closed by using vacuum seamer and heat processed at a temperature of 115.6 °C for a period of 60 minutes. The products were cooled and stored at ambient temperature. Further work is going on for standardization of time, temperature and pressure which are essential for preparation and preservation of fish sausage in natural casing using hot smoking and thermal processing.

INVESTIGATION NO. 2

Project Title: Development of women friendly fish vending and display unit

Investigators: C.V. Raju, and Lakshmisha I.P.

Objectives:

1. Improvement of cost effective, durable, contamination less, women friendly, fish vending and display unit by using alternate materials such as plastic/stainless, steel/fibre for fabricating and replacing the galvanized iron used earlier.
2. To make it more user friendly by fining wheels, covering display portion etc.
3. To test its suitability and ergonomics in market condition.

Progress:

Design engineers in the concerned area were consulted about old fish vending and display unit, which was fabricated using galvanized iron. The engineers have visited our site recently for examining the existing unit. They have been apprised about the objectives of our investigation briefly. A combination of stainless steel and fibre is planned for a new and improved version of display unit along with fining wheels for easy handling and operation for fisher women. Work is in progress to design both women friendly and cost effective vending and display unit.

INVESTIGATION NO. 3

Project Title: Development of technologies for the production of feed/food for the pet animals such as dogs, cats, pigs and aquatic animals

Investigators: C.V. Raju, and Lakshmisha I.P.

Objectives:

1. Collection of fish waste generated from fish processing industries for its effective utilization in pet foods.
2. To standardize the methods to recover meat from filleted frames by mechanical and chemical means.
3. To find out suitable technologies for the production of fish protein hydrolysates, fish meals and fish silage.
4. Production of pet foods in different forms like flakes, pellets, tablets, kibbles and biscuits etc.
5. Conducting the palatability tests of various by-products as ingredients in pet diets.

- To find out the nutritional quality, convenient packaging material and to study shelf life properties of these pet foods during storage under different conditions.

Progress:

New project, work is to be started.

INVESTIGATION NO. 4

Project Title: Risk analysis and establishment of TQM (total quality management) in pre-process operations

Investigators: C.V. Raju, and Lakshmisha I.P.

Objectives:

- Development of quality assurance system of commercial fish pre-process methods to improve the efficiency and profitability of their operations and quality of products.
- To study various factors influencing the quality of fresh fish such as method of catching, physical handling, time and temperature of fish
- To establish critical control point (CCP) at the time of harvesting and landing on shore
- To analyze the risks involved in the commercial handling practice and suggest remedial options.

Progress:

New project, work is to be started.

INVESTIGATION NO. 5

Project Title: Development of Shelf-Stable Ready to Eat Fish and Shellfish Products by Thermal Processing in Tin-Free-Steel Cans and Retortable Pouches

Investigators: C.V. Raju, and Lakshmisha I.P.

Objectives:

- To study on the suitability of TFS cans and retort pouches for processing of canned fish and shellfish products.
- To standardization of process parameters of prepared products.
- To study on the heat penetration characteristics of products in both TFS cans and retort pouches.
- Storage study of canned fish and shell fish products in both TFS and retort pouches

Progress:

New project, work is to be started.

MAFSU, MUMBAI

INVESTIGATION NO. 1

Project Title: Establishment and demonstration of model retail outlet for chicken

Investigators:

Objectives:

- To establish one new Agro-processing centre on fruits and vegetables
- Monitoring performance of APC
- To conduct demonstrations and trainings

Progress:

The design for model retail outlet for hygienic production of chicken meat has been developed. The architectural designs of the outlet and the approximate total estimate required for the establishment of model retail outlet will be submitted shortly.

INVESTIGATION NO. 2

Project Title: Utilization of buffalo slaughterhouse by-products for manufacturing of pet treats, bile concentrate and pork by-products for manufacturing bandages

Investigators:

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

Collection of buffalo slaughterhouse byproducts from different abattoirs has been started and preparation of pet treats is in progress.

Buffalo slaughter house byproduct such as bile was collected day to day basis immediately after slaughter of buffalo. About of 350-600 ml of bile from each animal was collected in a clean, dry plastic can and stored at chilling temp ($4\pm 1^{\circ}\text{C}$). Bile concentrate was prepared from this using two methods: (1) Open fire drying (3 to 4 h) and (2) Hot air oven drying (10h). Yield of bile concentrate from by hot air oven drying was more (i.e. 71 g/l) than by open fire drying method (i.e. 61.87 g/l).

INVESTIGATION NO. 3

Project Title: Design and development of poultry processing plant

Investigators:

Objectives:

Progress:

Collection and microbiological analysis of chicken meat samples from different retail markets is under progress to determine prevalence of specific microbes.

GBPUA&T, PANTNAGAR

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: Anupama Singh and scheme scientists

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

Farmers were trained about the modern processing techniques in food processing, food safety and security, food adulteration and its testing methods etc. Experts from the University delivered lectures on the related topics. Entrepreneurs were updated about the small scale processing technologies, government policies regarding the establishment of processing units etc.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: M. Sahgal and A. Singh

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 1 commercialized and 4 ready to commercialize technologies under AICRP and 2 commercialized technologies outside AICRP.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Uttara Kahand state.

Investigators: Anupama Singh, Khan Chand, N.C Sahi, U C Lohani

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Data base on Food Processing industries of the state has been prepared. Totally there are 141 processing units (small scale) in Uttaranchal state. Main products of the processing units are Jam, squashes, amala candies, pickles, catchups, syrups, juices etc. The main equipments used by them are fruit pulper, boiler, hydraulic press, etc. A survey performa was prepared and detailed information was collected from FPO licensed Food processing industries. Three success stories of entrepreneurs were prepared.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: A.K. Verma, P.K. More and U.C. Lohani

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

Under this project the complete information regarding the technologies viz., Potato Peeler and Jaggery chocolate developed at Pantnagar center has been given in the specific performa.

INVESTIGATION NO. 5

Project Title: Biochemical characterization of nutraceutical components of millets of Uttarakhand

Investigators: A. Dubey, A.K. Verma, Anil Kumar

Objectives:

1. Collection of millet varieties from different regions of the Uttarakhand
2. Biochemical analysis of millets for various factors responsible for nutraceutical properties of the grain viz; Total sachharides, crude fiber, total protein, total nitrogen content, protein digestibility, micronutreints- Fe, Ca and Mg, phenolics
3. Incorporation of millets along with other food grains for nutraceutical balanced diet

Progress:

Millet (barnyard millet and finger millet) varieties from different regions of Uttarakhand were collected for their biochemical characterization. Sugar content in barnyard as well as in finger millet was found less but sufficient to be used in fermentation process. It was found that the barnyard millet flour can be of a good source of dietary fibre for the fortification of wheat flour due to its have high dietary fiber than finger millet varieties.

INVESTIGATION NO. 6

Project Title: Production of ethanol and vinegar using apple pomace

Investigators: M. Sahgal, A. Singh, A.Dubey

Objectives:

1. To study fermentation kinetics viz -á- viz yeast strain (Y5)
2. To standardize the process for large scale production of ethanol (in fermenter)
3. Economical analysis of the process/product.

Progress:

Apple pomace were fermented at the conditions of temperature 30°C, agitation speed 40rpm, dilution range of substrate 1:10 and pH 4.3 for five days with enzyme, α -amylase and cellulase at the rate of 0.3 and 0.06 g /600 ml respectively. The study showed that the amount of ethanol production was highest (6.17%) in the substrate combination of 75% apple pomace and 25% molasses inoculated with yeast strain Y5 (1) with fermentation efficiency of 68.34. The cost of ethanol produced is estimated as Rs 2.10 per ml. It was also found that the amount of acetic acid obtained was Maximum (4.28%) at 11.96% (v/v) sugar concentration, initial pH (5.53) and acidification time 182.6 h.

INVESTIGATION NO. 7

Project Title: Post harvest management of underutilized crops of Uttarakhand (apricot stone grader, and kernel separator)

Investigators: U C Lohani, A Singh, B K Kumbhar, N C Shahi, S K Garg,

Objectives:

1. Oil extraction from bitter apricot kernel using enzyme
2. To develop a hand operated bitter apricot decorticator
3. To develop a pedal operated apricot stone grader
4. To develop a kernel separator

Progress:

Investigation was undertaken with the overall objective of optimizing the enzymatic parameters i.e. moisture content during hydrolysis, enzyme concentration (v/w of the sample), enzyme ratio and incubation period on wild apricot kernel processing for better oil extractability and increased oil recovery. The oil recovery increased in the range of 0.14 to 2.53 per cent. The corresponding conditions for maximum oil recovery was obtained at 23% (wb) moisture content, enzyme concentration of 15, 60:40 pectolytic:cellulolytic and 13 h incubation period. Under this project a hand operated decorticator for bitter apricot pits has been fabricated having 5 kg/ hr capacity and 87 % efficiency. Also a stone grader and a kernel separator have been fabricated and their testing is in progress.

INVESTIGATION NO. 8

Project Title: Post harvest management of medicinal plants of Uttarakhand

1. Standardization of drying parameters
2. Isolation of bioactive ingredient

Investigators: A. Singh, N.C Shahi, S.K Garg, U.C Lohani,

Objectives:

1. To develop a solar dryer for drying of medicinal crops of Uttarakhand
2. Drying characteristics of *Coleus Forskolii*
3. To develop a package of practice for isolation of bio active compounds from *Coleus Forskolii*

Progress:

A Solar Poly Tunnel Dryer (SPTD), consisting of a rectangular base frame, semi-cylindrical drying chamber, solar collector, absorber, air distribution system with chimney and wheels for its mobility, has been fabricated. This dryer is portable, batch type, solar operated natural convection type. The performance of SPTD under no load conditions during 1st November to 6th November 2009 revealed that the shade net had no effect on temperature and relative humidity inside the chamber but affected the quality of the dried material. The effect of drying temperature, thickness of sample, shade net and drying time on the drying behaviour of *coleus* roots was determined by SPTD in comparison with tray dryer (at 40°C, 50°C & 60°C) and sun drying. For SPTD the total drying time to reduce the moisture content from 15%(d.b) to 13%(d.b) was 280 min whereas for tray dryer, it was 230 min at 60°C. Hexane, chloroform and methanol extracts have also been isolated from the roots of *Coleus Forskolii* and the determination of forskolin content present in different extracts is in progress.

INVESTIGATION NO. 9

Project Title: Development of cocoa based jaggery products (bar, nuggets) and their commercialization

Investigators: P.K. Omre, B.K.Kumbhar

Objectives:

1. Development of jaggery nuggets
2. Performance of the product

Progress:

Cocoa, skim milk powder, butter, coffee and nuts (groundnut and cashew nut) were taken for making jeggery nuggets. The product was evaluated based on the sensory characteristics such as colour, taste, flavour, texture, appearance and overall acceptability. The overall acceptability score of the nugget with ground nuts was in the range of 4-8. Minimum score for texture was obtained for chocolates made of 20% groundnuts roasted for 4 min and with 8% fat and maximum with 15% groundnuts roasted for 3.5 min and with 8% fat. In case of nuggets with cashew nuts, the overall acceptability score was found in the range of 5-8. Minimum score for texture was obtained in chocolates having 8% fat, 4.5 min roasting time of 25% cashew nuts, and maximum in composition of 8% fat, 4 min. roasting time of 25% cashew nuts.

INVESTIGATION NO. 10

Project Title: Establishment of pilot plant for solid and liquid jaggery

Investigators: P.K. Omre, B.K.Kumbhar

Objectives:

1. Development of pilot plant
2. Performance of the plant

Progress:

The site of pilot plant, in front of University Gymnasium in CRC premises has been finalized and approved by the Vice-Chancellor. The constructed area would be 60x60 feet and 100x100 feet for material handling and other work. The plan layout, architect design and cost estimate has been finalized by DWP department. The list of the equipments for pilot plant has been finalized and final approval from PC, PHTS, CIPHET, Ludhiana has been obtained. The fund of Rs 5.00 Lacs has been released to purchase the equipments. The process for purchase of equipments is in progress. The BHOOMI POOJAN was done by Hon'ble Vice-Chancellor on 22nd August 2010 to start the civil work.

INVESTIGATION NO. 11

Project Title: Development of combined striking point alarm for solid jaggery, liquid jaggery and khandsari for technology transfer

Investigators:

Objectives:

Progress:

Not reported.

INVESTIGATION NO. 12

Project Title: Development of low calorie ice-cream

Investigators: N.C Sahi, A. Kumar, B.K. Kumbhar, A Singh

Objectives:

1. Standardization and optimization of process for manufacture of ice cream
2. Development of low calories iccream using stevia powder and probiotics.

Progress:

Low calorie icecream using stevia powder has been developed for diabetic patients

INVESTIGATION NO. 13

Project Title: Process development for low calorie- high fibre milk produce-Paneer

Investigators: A. Kumar, B.K Kumbhar, A.Singh, N.C Sahi

Objectives:

1. Development of a process for low-fat fiber-enriched milk product (paneer), a value added functional dairy food.
2. Utilization of functional ingredients like dietary fiber(s), fat replacer, and/or other nutraceuticals for improving functionality.
3. Study of changes in physico-chemical and sensory quality of finished product after adding functional ingredients.
4. Extension of shelf life of paneer using hurdle technology.
5. Statistical analysis of the data obtained during the study.

Progress:

Buffalo milk (Fat : SNF ratio of 1:1.65) was fortified with dietary fibre prior to coagulation at 70 °C with 1% citric acid solution to produce low calorie high fibre paneer. The hot coagulum was transferred into a circular stainless steel hoop and pressed for 10 minutes by applying weight of 1.5 kg /cm² for texturization of coagulated mass. Paneer is packed in polythene bags, sealed and then stored at 5 °C and 30 °C temperature. Experiments to improve shelf life of paneer by applying edible coating are under progress.

RAU, PUSA

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: M. Shrivastava and D. Rajak

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

The Agro-processing center at CAE, Pusa was established and inaugurated on 03.04.09. Total 64 quintals of Arhar grains from Pusa Farm of RAU, Pusa were processed for seed processing in seed screen cleaner-cum-grader of APC. All the scheme activities were demonstrated in Agri-Expo (*Kisan Mela*) - 2009 & 2010 held at RAU, Pusa. TNAU Insect Trap was specially demonstrated and about 150 traps were sold to farmers/other customers. Theoretical and practical demonstration of different post harvest equipments/machines under APC was done for different groups of school children (sent by Bihar Govt.) about 6-7 times.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: M. Shrivastava and D. Rajak

Objectives:

2. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 4 technologies developed by the centre under AICRP on PHT and on 3 technologies developed by the University.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Bihar state.

Investigators: M. Shrivastava and D. Rajak

Objectives:

1. Development of survey schedule for gathering required information for success stories of Agro-processing Industries in Bihar.

2. Survey work for gathering required information in developed proforma.
3. Scrutiny/compilation of gathered information and report writing for success stories of Agro-Processing Industries in Bihar.

Progress:

Survey schedule was prepared for gathering required information for success stories of Agro-processing Industries in Bihar. Two success stories have been prepared so far and survey work is under progress for information gathering for more success stories.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: M. Shrivastava

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The centre is yet to submit the Questionnaire 2 (to be filled by PI / RE) for the technology developed by the centre.

INVESTIGATION NO. 5

Project Title: Design and development of litchi peeling machine and destoner

Investigators: M. Shrivastava and D. Rajak

Objectives:

1. Survey of existing machines/technology for litchi processing particularly for peeling & destoning of litchi.
2. Design and development of Litchi Peeling machine and Litchi destoning machine / Improvement or modifications in existing machines.
3. Testing & evaluation of developed/modified machines.

Progress:

The available existing machinery/technologies was surveyed and One manufacturer (M/s Anyang General International Trading Co. Ltd., Henan, China) was identified after a through search on internet for procurement. Efforts were made to procure the machine but the machine could not be procured due to administrative reasons. It was in the process of procurement. A comprehensive technical bulletin on Post Harvest Management of Litchi was prepared and released during 27th Annual workshop held at UAS, Bangalore during 17-20 Dec., 2008.

UAS, RAICHUR

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators:

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings.

Progress:

During the reported period two new APCs were established in Raichur district. Common activity in both the APCs was production of Byadagi chilli powder. Chilli powder is being packed and marketed in Raichur city.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: Udaykumar Nidoni, A. A. Fazal, P. F. Mathad and Shankar. S

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has submitted information on 11 technologies developed by the centre under AICRP on PHT, on 10 technologies developed by R&D institutions and 22 commercially available technologies from reputed private firms, in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Karnataka state

Investigators: Udaykumar Nidoni, A. A. Fazal, P. F. Mathad and Shankar. S

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

From the intensive survey and collection of secondary data, major agro processing industries in North Karnataka are found in Gulbarga district (340) followed by Koppal (271), Bellary (229), Belgaum (213) and Raichur (140).

Two Agro-processing industries in each district of North Karnataka were selected for the preparation of success story on agro- processing industries.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: Udaykumar Nidoni, A. A. Fazal, P. F. Mathad and Shankar. S

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The centre has submitted the Schedule 1 (to be filled by beneficiaries) for 3 technologies and Questionnaire 2 (to be filled by PI / RE) for the technologies developed by the centre.

INVESTIGATION NO. 5

Project Title: Post harvest technology and management of Byadagi chilli (Solar tunnel drying, qualitative characteristics of Byadagi chilli, effect of milling)

Investigators:

Objectives:

1. To study the drying characteristics of Byadagi variety of chilli
2. To analyze the qualitative characteristics of Byadagi variety of chilli
3. To study the quality of chilli powder (with and without stalk)

4. To study the effect of different milling processes for Byadagi variety of chilli

Progress:

The experiments were conducted to assess the quality of chilli powder produced using three different milling methods namely pounding, pulverisation and low temperature pulverisation. The colour values (L^* , a^* , b^*) of the chilli powder were found to be 37.75, 35.42 and 35.40 respectively for pounding, 39.90, 37.25 and 39.36 for pulverisation and 39.10, 35.42 and 36.92 for low temperature pulverisation respectively. The ascorbic acid content of the powder was found to be 60, 70 and 67 mg/100g for pounding, pulverisation and low temperature pulverisation respectively. The titrable acidity was found to be higher (70%) for pulverisation followed by water cooled pulverisation (67%) and pounding (60%). Aflatoxin content was found nil in dried chilli and chilli powder produced using three methods of milling.

INVESTIGATION NO. 6

Project Title: Development and preservation of fish balls and fish sticks from low value and under utilized marine/freshwater fish

Investigators:

Objectives:

Progress:

Recipe standardized and shelf life determined for fish balls prepared from ribbon fish and fish sticks prepared from *puntius* sp.

Fish sausage was developed using bulleye fish (*Priacanthus hamrur*), popularly known as disco fish and the recipe was standardized using potassium sorbate or Nisin as the preservative. Shelf life studies of fish sausage as revealed after sensory evaluation showed that the sausage prepared using nisin (0.2%) could be stored up to 10 and 14 days under refrigerated ($6\pm 2^{\circ}\text{C}$) and ambient ($28\pm 2^{\circ}\text{C}$) conditions whereas with potassium sorbate (0.2%), it could be stored for 7 and 9 days respectively.

Smoked fish was prepared using a low value fresh water fish, Tilapia (*Oreochromis mossambicus*) popularly known as *Jilebi* fish. Brining of fish for 20 min and smoking for 45 min gave the product of highest acceptable score. The smoked fish products packed in 200 μm polypropylene pouches with 50 and 100% vacuum stored at ambient condition were acceptable up to 4 and 7 days and for 21 and 28 days under refrigerated condition.

Fish fingers were prepared using Pink perch (*Nemipterus japonicus*), a low value marine fish. The results revealed that fish fingers prepared with 70:30 proportion of fish meat:potato starch and battered with 25% bengalgram slurry gave a product of highest acceptability for the finger size of 60 x 10 x 10 mm.

INVESTIGATION NO. 7

Project Title: Design and development of pedal operated ice crusher

Investigators:

Objectives:

Progress:

The pedal operated ice crusher (capacity 800 kg/h, cost of operation Rs.1.56 per quintal of ice block, cost Rs. 20000/-) has been installed in Raichur fish market for regular use.

INVESTIGATION NO. 8

Project Title: Design, development and performance evaluation of fish deboner

Investigators:

Objectives:

Progress:

A fish deboner (Belt and drum type) was developed to separate the meat from the under-utilized fishes. The performance of the developed fish deboner was evaluated in terms of meat recovery, pin bone content and colour value of the meat. The machine has capacity

of 45-65 kg/h, production cost of Rs. 60,000/- and cost of operation at the rate of Rs. 47.89 per hour or Rs. 1.50 / kg

INVESTIGATION NO. 9

Project Title: Development of process technology for micro-encapsulation of fish oil

Investigators:

Objectives:

Progress:

Fresh oil samples of sardine (*Sardinella longiceps*) were collected from the fish oil plant. Quality parameters were analyzed and process parameters were standardized for fish oil micro encapsulation using spray drying technology.

Micro-encapsulated fish oil powder was collected both from collection jar and cyclone separators, flushed with nitrogen gas, sealed and stored in glass tubes.

INVESTIGATION NO. 10

Project Title: Adoption of solar drying technology (CIFT model and UAS Raichur model) for fish drying

Investigators:

Objectives:

1. To study the existing fish drying practices along the west coast
2. To install solar dryers at production catchments and evaluate their performance
3. To study the drying characteristics, quality parameters of solar dried fish in comparison with other drying methods
4. To study the economics of the technology
5. To transfer the technology among the fishermen, processors, entrepreneurs and consumers

Progress:

Quality parameters such as PV, FFA and microbiological aspects such as bacteria, fungi, actinomycets and E.coli of the dried fishes indicated that, drying fish under Solar Tunnel Dryer resulted in good quality product (needle fish) compared to open yard sun drying.

Value addition of minor millets (Kodo, Kutki and Sawan) by extrusion cooking

Kodo based and kutki based extrudates were developed in combination with maize and defatted soy flour. Moistur content (10 – 12%) and barrel temp (80 – 90 OC) were found to be important process parameters. Based on organoleptic and overall acceptability scores, the recommended formulation for extrudates is : 25 % kodo/kutik and 75 % maize, fortified with 10 % soy flour.

CAU, RAIPUR

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: Ajay Verma and K.K. Agrawal

Objectives:

1. To establish Agro-Processing Centre on turmeric.
2. To provide technical backstopping to the rural entrepreneurs/stake holders interested in starting post harvest industries on turmeric through training and demonstration.

Progress:

Dharsiwa block adjoining to Raipur, located at about 35 km from the AICRP centre was finalized to establish 5 numbers of turmeric processing centres. Four more number of

the turmeric processing centers is in the pipe line in the same area. These stake holders have been trained on the technologies of turmeric processing. In addition, other small processors and member of SHGs have also been trained on turmeric processing and capacity building on this technology.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: Ajay Verma and K.K. Agrawal

Objectives:

1. To compile a compendium of proven transferable post harvest technologies developed by ICAR/SAU's/ Scheme and commercialized.

Progress:

Database development and its documentation for proven post harvest technologies in Chhattisgarh under three categories are prepared viz. AICRP on PHT, IGKV, Raipur, SAU- IGKV, Raipur and commercially available in Chhattisgarh state.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Chattisgarh state

Investigators: Ajay Verma and K.K. Agrawal

Objectives:

1. To study the present status of agro processing industries in the Chhattisgarh state.
2. To prepare 10 no. of success stories of agro processing industries in the Chhattisgarh state.

Progress:

Data from the DIC was obtained and studied. Survey of Kanker district was conducted and the desired information was collected.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: Ajay Verma and K.K. Agrawal

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

Impact on the adoption of modern dal mill (PKV, Akola type), Maize sheller, Mini rice mill and Hold on Paddy Thresher was studied.

INVESTIGATION NO. 5

Project Title: Performance evaluation and popularization of prototypes developed at other PHT Centers and other R&D institutions (Grain cleaner, dehuller, Sunflower thresher, Maize sheller)

Investigators: Ajay Verma and K.K. Agrawal

Objectives:

1. To identify the equipments and processes suitable for post harvest loss reduction and value addition in the selected crops of the region.
2. To procure the selected equipment, their installation, testing and adoptive modifications (if any).

3. To assess financial viability of these in comparison to the existing practices.
4. Technology promotion, entrepreneurship development, and monitoring.

Progress:

Feasibility testing of Sunflower thresher was carried out for 12 hours covering the crop area of 6 ha. The output of thresher was found as 700-800 kg/h, threshing efficiency 98%, cleaning efficiency 88% and cost of operation Rs. 60/q. The output capacity of the maize sheller was found to be 15-18 kg/h, shelling efficiency and cleaning efficiency 100% and cost of operation Rs. 120/q. Five demonstrations on hand maize sheller were conducted to the Government Agricultural Officials during the monthly workshop at the University HQ. About 15 number of demonstrations were also conducted for the farmers in APC, IGKV, Raipur during their visit to the centre.

INVESTIGATION NO. 6

Project Title: Value addition of minor millets (Kodo, Kutki and Sawan) by extrusion cooking

Investigators: Ajay Verma and K.K. Agrawal

Objectives:

1. To study the extrusion cooking characteristics of kodo, kutki and sawan millets.
2. To study the effect of soy and maize fortification with kodo, kutki and sawan on extrusion cooking characteristics.
3. To study the physical, textural and quality characteristics of extrudates prepared from various blends.
4. To optimize the process variables.
5. To study the storability of the extrudates over a period of time.

Progress:

Efforts have been made to develop extrudates from *kodo* and *kutki* millets in combination with maize and defatted soy flour in different proportions. The highest expansion of extrudates was obtained at 15 % moisture content of feed in case of *kodo* based extrudates and 12 % in case of *kutki* based extrudates, beyond which the expansion of the products decreased. The maximum expansion of products was achieved with 10 per cent blending of soy flour with different combinations of other ingredients. Based on organoleptic and overall acceptability scores, the extrudates prepared with the combination of 25 per cent *kodo/kutik* and 75 per cent maize along with 10 per cent fortification of soy flour was liked very much by the panelists.

INVESTIGATION NO. 7

Project Title: Evaluation of mango cultivars for preparation of mango leather and powder and development of pilot plant for manufacture of mango leather

Investigators: Ajay Verma and K.K. Agrawal

Objectives:

1. Value addition and entrepreneurship development. (To be concluded and RPF III submitted)

Progress:

The available local mango cultivars have been analyzed for their physico chemical properties. Screening of these local mangoes has also been done for processing and converting into mango leather (Aam papad) and dehydrated mango pieces (Amchur). The process technologies for the above two products have been optimized.

INVESTIGATION NO. 8

Project Title: Adaptive trials on

1. Turmeric processing equipment from Bhubaneswar and Coimbatore centres
2. Raw mango cutter from IIHR
3. Tamarind dehuller-cum-deseeder from Bangalore centre

Investigators: Ajay Verma

Objectives:

1. Technology promotion, entrepreneurship development, and monitoring

Progress:

The design of turmeric curing/boiler was finalized on the basis of the performance report of AICRP on PHT, Bhubaneswar and got fabricated in IGKV, Workshop. The initial trials were conducted in the farmer's field. The improved boiler gave the average curing time as 55 min for 100 kg turmeric. The cost of operation was Rs. 30/q which is nearly 50% of traditional method.

Adaptive trials were carried out on Tamarind dehuller cum deseeder. The dehulling capacity and efficiency of the machine was 259 kg/h and 84% respectively. The deseeding capacity of the machine is 48 kg/h with 54% efficiency. Dehulling was found 8 times faster and seed expulsion was 10 times faster than the traditional method.

YSPUH&F, Solan

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: PC Sharma, Devina Vaidya and Dev Raj

Objectives:

1. To impart training to farmers/ farm women, rural youth, entrepreneurs and members of self help groups on post-harvest handling of horticultural crops.
2. To encourage prospective entrepreneurs to establish their own agro processing industry through shelf help/ NGO in production catchments.
3. To establish and monitor the working of APC's in different parts of state.

Progress:

Four APCs on Apricot oil extraction in different parts of Himachal Pradesh have been established. Besides, two APCs established by NGOs (Sushree Khormoshu SHG Spillover and WWF-Nature, Raksham in Distt Kinnaur) have been guided and monitored. Nine farmers were trained and provided hands on practices on Apricot kernel oil extraction. Two trainings on "Demonstration of technologies for establishment of Horticultural crops based processing units" of farmers, rural youth and women/shelf help groups of seven districts of Himachal Pradesh were conducted on 22nd-28th February, 2010 and 8th-13th March, 2010 (trainees from Bilaspur, Hamirpur, Una and Mandi). In these trainings 42 women trainees and 2 men were imparted training on different aspects of handling fresh commodity, value addition to different products, different sources of finance for establishing unit.

Project proposal on Establishment of agro-processing centre on apricot (chulli / wild apricot) oil extraction for Sh Susheel Sana, VPO Pooh, Kinnaur has been prepared and submitted under Central Sector Scheme for subsidy.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: Devina Vaidya, Dev Raj, Anil Verma and Anil Gupta

Objectives:

1. To collect the information about developed/proven post harvest technologies from SAU and AICRP centres

Progress:

Information on different technologies pertaining to handling and storage of fresh horticultural commodities, processing for value addition, drying, food industries waste utilization in different crops like apple, stone fruits (peach, plum and apricot), mushrooms, potato, etc has been compiled and submitted.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Himachal Pradesh state.

Investigators: PC Sharma, Anil Verma and Dev Raj

Objectives:

1. To collect secondary information about the Agro- processing industries in H.P.
2. To find out significance and performance of different Agro- processing industries (fruit and vegetable processing units) in HP
3. To compile success stories of Agro- processing industries dealing with horticultural crops

Progress:

A complete secondary information from Industries Centres of six districts and partial information from five districts of Himachal Pradesh have been collected. There are 1296 agro-processing units in six districts which are distributed as 42 in Kullu, 69 in Kinnaur, 715 in Bilaspur, 76 in Solan, 70 in Sirmour and 324 in Mandi mainly dealing with fruit and vegetable processing (90), cereal grain processing (Bread and Bakery) (1064), milk processing (9), oil extraction (64), spices (8), essential oil extraction (35), honey (1), mineral water (8), packaging boxes (4), etc. Success stories of seven agro-processing units and two units established in Utrakhand utilizing the technical advice and guidance from AICRP on PHT (Solan Centre) have been compiled.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: Devina Vaidya, Anil Gupta and Anil Verma

Objectives:

5. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
6. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
7. To assess the possible impact on household food and nutritional security
8. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

Complete information pertaining to progress of apricot oil extraction unit established by Sushree Khormoshu Self help Group, Spillow Distt Kinnaur in Himchal Pradesh has been compiled and submitted.

INVESTIGATION NO. 5

Project Title: Adoption / development of a 2 tonnes/day capacity mechanical conveyor grader for grading of apples (scaling down and modification of CIAE Bhopal model and/or PDKV Akola model)

Investigators: PC Sharma, Devina Vaidya and Anil Verma

Objectives:

1. To evaluate the performance of apple graders installed in different parts of apple growing areas in comparison to the performance of PDKV – Akola (Roller type) and CIAE Bhopal (Conveyer type) fruit graders.
2. To work out further improvement in mechanical graders for enhanced efficiency

Progress:

Portable fruit grader has been evaluated for mechanical grading of apples. In order to reduce damage and bruising of fruit, some modifications in the fruit graders PDKV – Akola model (Roller type) and CIAE Bhopal (conveyor type) like reduction in dropping height of the fruits have been made. Further, few farmers are using fruit grader cum polisher supplied by M/s Vishvakarma Enterprises, Ambala and the results are being compiled.

INVESTIGATION NO. 6

Project Title: Utilisation of apple pomace for manufacture of pectin, fibre and ethanol.

Investigators: PC Sharma and Anil Verma

Objectives:

1. To optimize method for drying and storage of apple pomace for pectin and fibre extraction.
2. To study the economic feasibility of pectin and fibre extraction from apple pomace.

Progress:

Drying of pomace in polytunnel solar drier to a moisture content of about 10 %, after washing and blanching (in boiling water for 8 minutes), was optimized with respect to the quality attributes like better retention of pectin, fibre and sensory attributes. Packaging of finely ground pomace in PE pouches and storage at low temperature was found to be the best treatment with respect to better retention of nutrients, less moisture uptake and without caking during 6 months storage in comparison to gunny bag storage at ambient conditions. The method for pectin extraction from apple pomace was standardized. Also the method for preparation of apple pomace dietary fibre enriched mango nectar and apple drink containing 2.5-5% fibre was optimized.

INVESTIGATION NO. 7

Project Title: Development and adoption of mechanical grader, decorticator and separator for apricot stones and kernels

Investigators: PC Sharma and Anil Gupta

Objectives:

1. To develop mechanical grader for grading of stones prior to decortication.
2. To refine the method for decortication of stones by application of
3. different pretreatments.
4. To develop mechanical separator for kernel separation from decorticated stones.

Progress:

Mechanical decorticator has been modified with the addition of three vertically arranged sieve trays by which the quantity of broken kernels was reduced to 2.7% and the recovery of whole kernels increased to 97.3% against 11.3% and 88.7% respectively in the decorticator without sieves. Mechanical separator consists of coarse rubber belt moving in opposite direction from the flow of decorticated stones (shells and kernels) has also been designed and got fabricated for separation of the apricot kernels from the crushed mass. On the basis of preliminary trials, about 70% of the kernels can be separated by using this method.

INVESTIGATION NO. 8

Project Title: Technology for extension of shelf life of white button mushroom and preparation of white button mushroom powder by dehydration

Investigators: Devina Vaidya, Dev Raj and Anil Gupta

Objectives:

1. To optimize the pre-treatments for packaging and storage of fresh mushroom.
2. To evaluate different packaging material for extending and maintaining the shelf-life of fresh mushroom for retailing and bulk handling.
3. To optimize the process parameters for drying of mushrooms
4. To standardize the formulation of different ingredients for the preparation of mushroom based extruded products
5. To optimize the extrusion parameters for product development
6. To commercialize and popularize the developed technology and products after pilot scale testing.

Progress:

The method, consisting of washing fresh mushrooms in solution containing 0.5% each of CaCl₂, citric acid and KMS followed by air drying, packaging in poly ethylene bags and storage at refrigerated temperature, which experienced minimum loss of weight, least

changes in quality attributes during storage upto 15 days was selected as optimum. The studies on packaging of fresh mushrooms after washing (in solution containing 0.5% each of Citric acid, CaCl₂ and KMS) and air drying in jute bags along with CO₂ scavenger (3g MgO) sachets and storage under refrigerated conditions is in progress.

INVESTIGATION NO. 9

Project Title: Pretreatment and process for preparation of intermediate moisture product from plum fruits

Investigators: Dev Raj, PC Sharma, Anil Verma and Anil Gupta

Objectives:

1. To standardize pretreatment for removal of waxy layer (bloom) from surface of plum fruits
2. To optimize conditions for osmotic dehydration of plum fruits.
3. To find out optimum drying method and temperatures for plum fruit dehydration
4. To optimize packaging and storage conditions for dried products.
5. To develop protocol for drying of plums for commercial adoption

Progress:

Out of different combinations (cold or boiling lye (0.5% NaOH) solution as well as cold 5% ethyl oleate), dipping fruits in hot lye solution (0.5% NaOH) for 10- 15 sec was found satisfactory for removal of bloom from fruit surface to aid in faster removal of moisture during osmotic dehydration. Slow method of osmotic dehydration i.e., dipping fruits after lye treatment in 40°B sugar syrup for overnight and raising the strength of syrup by 5°B on-alternate day till 70°B followed by drying in a mechanical dehydrator (55°C) was found as optimum method for plum fruits.

SKUAST, SRINAGAR

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: M A Mir, Syed Zamir / H R Naik and A H Rather

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

Establishment of agro processing centre at village Singhpora Kalan Dist. Baramulla, a backward area has been taken up with the progressive farmer Mr. Abdul Karim Bhat. He has agreed to provide space/land for the establishment of APC. The area is known for cultivation of fruits, vegetables, cereals and oil seeds. Several traing programmes and demonstrations were organized by the centre.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: M A Mir, Syed Zamir / H R Naik and A H Rather

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has compiled and submitted information on 2 technologies developed by the centre under AICRP on PHT and 4 from the University, in the prescribed format.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in J&K state

Investigators: M A Mir, Syed Zamir / H R Naik and A H Rather

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Information has been collected on a number of food processing units registered with different District industries Centers of the state. The centre has compiled 3 good success stories. The agro processing industry in this state is in infancy and needs lot of scientific interventions. Area production and the existing status of industries has been recorded but the project needs to survey status again during 2010-11 as the concerned departments data was found incomplete.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT
Investigators: M A Mir, Syed Zamir / H R Naik and A H Rather

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

Detailed information has been collected and compiled on four technologies.

INVESTIGATION NO. 5

Project Title: Evaluation of Post Harvest Parameters and Value addition of commercially grown cereals in J & K State

Investigators: M A Mir, Syed Zamir / H R Naik and A H Rather

Objectives:**Progress:**

A status paper has been developed with profiles of major crops grown, post harvest losses, research needs and market potentials.

INVESTIGATION NO. 6

Project Title: Feasibility testing of apple and pear fruit harvester

Investigators: M A Mir, Syed Zamir / H R Naik and A H Rather

Objectives:

1. To identify equipments and processes suitable for post harvest loss reduction and value addition to agricultural and horticultural produces in high hills and valley areas of J&K.
2. Procurement of selected equipments, their installation, testing and adoptive modifications.
3. To assess financial viability of these comparison to the existing practices.
4. Technology promotion, entrepreneurship development by monitoring.

Progress:

Following four types of mechanical harvesters were developed and subjected to field evaluation,

H - 1. Harvester with full round shaped fixed cutting blade.

H-2. Harvester with cone shaped fixed cutting blade.

H - 3. Clutch type harvester with cutting Scissors and adjustable handle length

H - 4. Harvester with half round shaped fixed cutting blade

Clutch type harvester with cutting Scissors and adjustable handle length was found most efficient and superior over other three harvesters because of its light weight, ease of separating stalk, smooth flow of harvested fruit into the net and negligible mechanical

damage to the fruit. A minimum cumulative physiological loss in weight of 8.05 % was recorded in the samples harvested by Clutch type harvester compared to the maximum of 15% in samples harvested with harvester having half round shaped fixed cutting blade. Besides the fruits harvested by clutch type harvester were found firmer as they retained fruit firmness of 9.66 lbs/ sq inch after 20 days of ambient storage from an initial value of 11.50 lb's /sq inchs. The harvesters shall be tried for apple in year 2010 in the month of October the harvesting season of the crop.

INVESTIGATION NO. 7

Project Title: Adoption / development of dried apricot grader

Investigators: M A Mir, Syed Zamir / H R Naik and A H Rathe

Objectives:

1. To identify equipments and processes suitable for post harvest loss reduction and value addition to agricultural and horticultural produces in high hills and valley areas of J&K.
2. Procurement of selected equipments, their installation, testing and adoptive modifications.
3. To assess financial viability of these comparison to the existing practices.
4. Technology promotion, entrepreneurship development by monitoring.

Progress:

The centre in collaboration with Division of Agriculture Engineering SKUAST-K Shalimar designed and fabricated one manually operated grader for grading of dried apricots on the basis of grade specification devised during the survey. Its average capacity was found to be 200-250 kg/h with grading efficiency 81.4 to 92.5 depending on the feed rate. It costs about Rs 23,000/-. The grader had tremendous response amongst growers and traders. Prototypes of the improved machine shall be manufactured for commercialization during 2010-2011 after modifications in the sieves.

KAU, Tavanur

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: S.M. Mathew and G.K. Rajesh

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

The first APC of this centre at Naduvattom is running with two units of areca leaf plate making machine and a hammer mill for spices. From the survey, it was found that coconut is the major agricultural produce of this area. Tavanur campus spanning an area around 100 acres is producing 1,00,000 coconuts/year. Value addition is the only profitable way for coconut cultivation considering the present market rate for raw coconut. Oil mills in Tavanur panchayat is not sufficient enough to meet with the coconut production. Hence this centre has decided to start a model APC with coconut oil extraction plant. Accordingly, a copra cutter, oil expeller and a plate and frame oil filter were purchased and will inaugurate shortly.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: S.M. Mathew and G.K. Rajesh

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

The centre has already submitted the details regarding this project to the PC's office in the prescribed format. The machineries selected for this project are Cardamom polisher, Pineapple peeler corer cum slicer, Ashgourd seed extractor, Pepper thresher, Keramithra and Tender coconut punching machine.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Kerala state.

Investigators: S.M. Mathew and G.K. Rajesh

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

The fourteen districts of Kerala state was divided in to three by the three AICRP on PHT centres. Of these, Malappuram, Thrissur, Palakkad, Ernakulam and Idukki districts were selected by this centre. After the preliminary survey, the centre has visited the industries of the selected districts. The preparation of the success story of the selected APCs is in progress.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: S.M. Mathew and G.K. Rajesh

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

The improved method of standardization of curing of vanilla has been developed and the method faster, less energy intensive and produces quality output in terms of vanillin content. Vanilla beans are killed in hot water at 63°C for 3 min. Initial weight of vanilla beans reduced to half under mechanical drying at 55°C for 90 min/day for nearly 12 days, then slow dried at 70 % RH for nearly 7days to reduce the initial weight to one third. The slow dried beans are kept for conditioning for 3 months in suitable packaging material.

The development of black pepper decorticator has completed in December 2009 and it was reported to the ICAR. It decorticates the presoaked berries by the combined effect of churning and centrifugal action. In order to facilitate the efficient decortications, 16 spikes are fixed in staggered arrangement on the shaft which rotates at a speed of 142 rpm.

INVESTIGATION NO. 5

Project Title: Modified Atmosphere Packaging and storage of cured vanilla

Investigators: G.K. Rajesh, P P Thasna and S.M. Mathew

Objectives:

1. To study the effect of cured vanilla under various packaging materials
2. To study the effect of cured vanilla under various packaging atmosphere
3. Quality analysis of stored cured vanilla in terms of vanillin and moisture content

Progress:

Vanilla beans cured by the improved method, developed at Tavanur centre, were packed under passive MAP, active MAP and vacuum packaging using PP, LDPE, laminated PE of 400 gauge. After three months, cured vanilla beans packed in vacuum packaging was

found attacked by *Penicillium species* and *Aspergillus niger species*. To avoid the bending of cured beans during storage, vanilla beans were packed in PP tubes of one inch diameter using passive MAP technique only after considering the cost of packaging. Till now no infestation was found in any of the packets. Stored samples are sending to spice board, Cochin in every 3 months for quality analysis.

INVESTIGATION NO. 6

Project Title: Development of black pepper decorticator

Investigators: S.M. Mathew and G.K. Rajesh

Objectives:

1. To incorporate modifications to enhance efficiency
2. To evaluate the modified prototype decorticator for its performance
3. Analysis of the quality of the white pepper produced
4. Popularize the prototype black pepper decorticator

Progress:

The development of black pepper decorticator has completed in December 2009 and it was reported to the ICAR. It works on the principle of combined effect of churning and centrifugal action. In order to increase the efficiency of decortication, sixteen spikes are fixed in staggered arrangement on the shaft which is fixed inside a decorticating drum. After conducting studies on effect of speed on decorticating efficiency 142 rpm was fixed for further studies. The machine is working with 0.5 hp single phase motor of 1440 rpm. The decorticating efficiency obtained was 91.8 %.

INVESTIGATION NO. 7

Project Title: Development of HACCP protocol for safe pepper and pepper products

Investigators: K.P. Sudheer, C. Deepthi and P.P. Thasna

Objectives:

1. To conduct a survey among spice farmers of Kerala state to identify critical gaps in production and processing practices with special reference to food safety and quality.
2. Establishment of Infrastructure facilities for the assessment of food quality and safety.
3. To create awareness of food quality and safety issues of spices and spice products.
4. To develop HACCP protocols for safe and high quality spice products.

Progress:

A detailed worksheet is prepared to identify the CCP's and for the development of new protocol for the preparation of black pepper and value added products from pepper viz. dehydrated green pepper. With the help of worksheet and CCP's a new HACCP protocol is proposed for the small and medium scale industries by modifying the process lines and human interventions for maintaining quality of final products.

INVESTIGATION NO. 8

Project Title: Process and equipment development for vanilla oleoresin

Investigators: G.K. Rajesh and S.M. Mathew

Objectives:

1. Study of various methods for the extraction of vanilla oleoresin
2. Selection of a suitable solvent for the extraction
3. Optimization of process parameters like contact time and material to solvent ratio
4. Quality analysis of extracted Oleoresin
5. Development of an extractor for the preparation of vanilla oleoresin

Progress:

The various process parameters like method of extraction, time, best solvent and material to solvent ratio were standardized. The maximum vanillin content of 3.92% was obtained in the hot extraction process using Isopropanol as solvent. Based on this, a pilot plant for vanilla oleoresin extraction plant was fabricated and tested.

INVESTIGATION NO. 9

Project Title: Process and equipment development for vanilla extract and flavouring

Investigators: G.K. Rajesh and S.M. Mathew

Objectives:

1. Standardization of process parameters for better extraction of vanilla
2. Development of an extractor for the preparation of vanilla extract and flavoring
3. Storage /ageing studies of vanilla extract
4. Quality analysis of vanilla extract and flavoring in terms of vanillin content

Progress:

After standardizing the process parameters, a vanilla extractor was fabricated and tested. The extractor works on the principle of hot percolation method. The extracted sample was analyzed with 0.19 % vanilla. Also to study the effect of flow rate on extraction efficiency and vanillin content, the existing vanilla extractor is modified. For the full development and also to fix the aromatic constituents the extract is kept for ageing with various proportions of agents like sucrose and glycerin. In order to study the effect of ageing, the samples were sent in every three months gap to Spices Board, Cochin for quality analysis in terms of vanillin content.

INVESTIGATION NO. 10

Project Title: Development of pilot plant for osmotic dehydration of green pepper

Investigators: S.M. Mathew and G.K. Rajesh

Objectives:

1. To study the effect of pretreatment on retention of the green colour
2. Standardization of Osmotic parameters to get good coloured osmotically dehydrated green pepper
3. Development of an Osmotic dehydration plant
4. To study the drying characteristics of osmotically dehydrated green pepper
5. Evaluation of quality of dehydrated product
6. Storage and packaging studies of osmotically dehydrated green pepper

Progress:

Pepper (*Piper nigrum* L.), Panniyur and Karimunda variety harvested at moisture content of 70.4 and 68.3% w.b were used to standardize the optimum stage of maturity. The green pepper was blanched for 15 min in boiling water. An osmotic dehydration plant was fabricated and tested. After osmotic dehydration secondary drying was done using by freeze drier and tray drier at 40, 50 and 60°C. The quality of osmotically dehydrated green pepper was assessed. Since this is not the harvesting season of pepper the experiment will continue with freshly harvested pepper in November 2010. The centre has fabricated a steam blancher and this has yet to be tested.

INVESTIGATION NO. 11

Project Title: Development of banana (CV.Nandran) peeler for chips making.

Investigators: G.K. Rajesh and S.M. Mathew

Objectives:

1. Study of existing methods used for peeling of Nendran variety banana for chips
2. Development of a banana peeler for the production of chips
3. Evaluation of the developed banana peeler

Progress:

A survey was conducted in the adjacent districts of this centre namely Kozhikode, Thrissur and Palakkad to study the existing methods of banana peeling. The field study revealed that no mechanical banana peeler has been developed so far. In banana processing factories, peeling of banana is still done traditionally using knife. After studying the physical and mechanical properties of Nendran banana, the first model was fabricated with a 'Y' shaped cutting blade which is perpendicular to the handle. Since it is time consuming and not of user friendly, the second model was fabricated and tested.

CTCRI, Trivandrum

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: J.T. Sheriff, M.S. Sajeev and G. Padmaja

Objectives:

1. To establish one new Agro-processing centre on fruits and vegetables
2. Monitoring performance of APC
3. To conduct demonstrations and trainings

Progress:

Training on post harvest machineries and value addition in tuber crops with special reference to cassava had been given to 5 Men (Palakkad and Trichur district), 12 agril. officers, 5 persons from Kannur and Wayanad, 12 men from Guruji Purusha Swayam Sahaya Sangam, Ottasekharamangalam, Trivandrum, 12 women from Trivandrum Social Service Society, 10 women from Punalur Social Service Society, Kollam, 11 women from Kunnathukal Krishibhavan, Trivandrum, 6 women from Pathanamthitta and 1 man from Kannur. Technology on value added products from cassava sold to one trainee owning Highland Foods, Malappuram.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: J.T. Sheriff, G. Padmaja and M.S. Sajeev

Objectives:

1. Database development and documentation of R&D and commercial post harvest technologies

Progress:

Database on the following technologies for cassava were prepared viz., harvester (first & second order lever type), peeling knife, chipping machine (Hand, power & pedal operated), mobile starch extraction plant, cassava rasper, feed granulator, fried snack foods from cassava based composite flour,, liquid adhesive plant for cassava starch, fried cassava chips with improved textural quality and better colour, protein and dietary fibre enriched cassava mini- papads, ethanol from cassava, starch based biodegradable plastics, cold water miscible starch (Texcool), a process and design to reduce pollution load in waste waters of cassava starch / sago factories, thippi (cassava starch factory waste) based broiler feed. Curcuma grinding machine (Private), technologies from NIIST, Trivandrum viz., RRLT-NC driers (Model 201, 221,151, 101), Fresh ginger processing technology, swing technology for spices oil, oleoresin and encapsulated flavours from fresh/dry spices.

Data base on 25 post harvest technologies of tuber crops, spices and plantation crops were prepared

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Kerala state

Investigators: M.S. Sajeev and J.T. Sheriff

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Data through survey on the registered industries were collected from the respective district industries centers and with their help the details about the successfully running industries were collected by personally visiting them.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: M.S. Sajeev, J.T. Sheriff, G. Padmaja and A.N. Jyothi,

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology

Progress:

Impact of technology, in terms of monetary benefits, saving in labour and time were assessed for various machineries viz., hand operated chipping machine, pedal operated chipping machine, motorized chipping machine, cassava rasper, cassava peeling knife, cassava harvester.

INVESTIGATION NO. 5

Project Title: Production of food extrudates from tuber flour/starch

Investigators: J.T. Sheriff, G. Padmaja, S.N. Moorthy and M. S. Sajeev

Objectives:

1. Nutritional and sensory evaluation of cassava extrudates
2. Extrusion trials of sweet potato flour-physical properties of extrudates
3. Textural and functional properties of cassava, sweet potato, banana and coconut flour extrudates

Progress:

Physical and textural properties of orange fleshed sweet potato, Amorphophallus flours extrudates, extrusion trials of 3 varieties of banana flour were blended with cassava flour and their evaluation, extrusion trials of flours from five varieties of over matured cassava (19, 21 and 24 months tubers) tubers and their characterization, physico-textural changes of extrudates from the blends of cassava and sweet potato starch, and extrusion of fermented cassava flour blended with coconut flour and the physical, nutritional and textural properties of extrudates were determined. A highly expanded extruded product with expansion ratio of 3.52 was obtained with 24 months matured cassava.

INVESTIGATION NO. 6

Project Title: Development of bio films from native and modified starch

Investigators: M.S. Sajeev, J.T. Sheriff and A.N. Jyothi,

Objectives:

1. Effect of different plasticizing agent and hydrocolloids on the rheology and biofilm forming properties of tuber starches
2. Development of biofilms from modified starches
3. Effect of addition of antimicrobial agents on rheology and film forming properties
4. Effect of addition of nano materials to starch on biofilm forming properties

Progress:

Glycerol composites were developed from cassava starch added with hydrocolloids (acacia and tragacanth gum) and xanthan gum to get binary composites of starch:gum. Rheological and pasting properties of glycerol composites were measured. Modelling of the mechanical spectra using power law to characterize the gelled starch-hydrocolloid-glycerol system was done. Cassava starch was modified with sodium hypochlorite. The effect of addition on the pasting and rheological properties of the starch was analyzed. Rheology of native cassava starch with different antimicrobial agents like cinnamon oil, clove oil, ginger oil, garlic oil and lemon grass oil added was analyzed. The physico-mechanical properties of films made from modified cassava starch, cassava starch and sweet potato starch-glycerol-hydrocolloids were evaluated. Characterization of starch-hydrocolloid-glycerol-antimicrobial composites and biofilms from sweet potato starch was done.

INVESTIGATION NO. 7

Project Title: Process technology for the production of tuber based dehydrated quick cooking products

Investigators: M. S. Sajeev, J.T. Sheriff and A.N. Jyothi,

Objectives:

1. To develop shelf stable dehydrated quick cooking cassava and *Amorphophallus* tubers with comparable organoleptic quality as that of cooked fresh tubers, which have domestic as well as export market

Progress:

The tubers of cassava and *Amorphophallus* cut into different sizes and cooked for 30 min then cooled to ambient temperature. They were frozen at different temperatures. Drying studies were conducted under micro wave tray drying and convection oven drying. Textural properties, rehydration and colourimetric studies of dehydrated samples with respect to freezing temperature, thickness of tubers and drying temperatures were done. Effect of freezing and thawing time on the drying characteristics of the cooked and frozen tubers were observed. Quick cooking dehydrated tubers of cassava and *Amorphophallus* tubers were developed.

INVESTIGATION NO. 8

Project Title: Storage pest and disease management of yams and aroids

Investigators: C.A. Jayaprakas, C. Mohadas, and V. Hegde

Objectives:

1. To minimize the post harvest spoilage of tubers of yams and aroids by insect pests, nematodes and pathogens using various management practices.

Progress:

Physio-chemical, functional and textural changes of mealybug infested and uninfested tubers of elephant foot yam (EFY) were analyzed during storage for 4 months. Biopesticide prepared from cassava seed was formulated with surfactants and tested against mealybug infested EFY and *Dioscorea* tubers and found a concentration of 3% effective. Biopesticide extracted from cassava leaf by distillation method was treated against nematode infested white yam tubers at various concentrations 1:1, 1:3 and 1:5 (distillate: water) and mortality of nematode was observed in all the dilutions. The sprouting inhibition was observed 20% of the highly infested tubers. Chemical structure of the mealy substance was studied using IR spectroscopy and found that it is long chain carbon compound. Various solvents, both natural and synthetic, were studied for the removal of mealy substance. Biopesticide prepared from cassava leaves for management of mealy bugs in stored tuber of EFY.

INVESTIGATION NO. 9

Project Title: Development of continuous cassava processing machineries (100 tonnes/day capacity) for washing of cassava tubers, jet washing of cassava starch, sieving of starch.

Investigators: J.T. Sheriff, M. S. Sajeev and A.N. Jyothi,

Objectives:

1. Design of high pressure low volume (water) starch washing system
2. Industrial evaluation of rasper
3. Fabrication of high pressure low volume (water) starch washing system Design of settling channels

Progress:

A commercially available vegetable washer available at Karunya University, Coimbatore was evaluated for cassava tubers. Industrial rasper developed at CTCRI was field tested at M/s Jyothi Starch Factory, Mettala, Salem and based on the observations, modification were carried out in the feeder assembly and base frame. Capacity of the washer was found to be 312 kg/h and rasper -1.9t/h. Energy of crushing using the CTCRI rasper was reduced by about 15 KW, savings over traditional rasping in terms of energy = Rs. 43,200/ per season of 60 days.

MPUA&T, UDAIPUR

INVESTIGATION NO. 1

Project Title: Establishment of Agro Processing Centre, training and demonstration of technologies

Investigators: N. K. Jain, K.C. Sharma, V.D. Mudgal and Sunil Kumar

Objectives:

1. Establishment of location specific unit technologies at the rural site.
2. Study of techno-economic feasibility of APC model at village level.
3. To conduct trainings and demonstration of field worthy technologies.

Progress:

As sanction for proposal submitted for APC under CSS is awaited, efforts were made to create awareness regarding processing and value addition at different forum through demonstrations, presentations, exhibitions at university/state level fairs. An entrepreneur was trained at PHT, MPUAT, Udaipur and given technical support to select and purchase a soya milk/paneer unit. He has recently established soya milk and paneer (tofu) unit at village, Vana and started production of approximately 20-25 kg paneer and 40-50 litre of flavored milk. He is supplying paneer and milk to hotels/restaurants/schools/gyms with profit @ 30-40 %. Now, he is planning to extend the same supply in adjoining states. The APC at village Segwa established in the year Nov. 2003 was monitored and was observed to earn Rs. 8,000-10,000/- month through floor/spices/milling/aonla and tomato processing activities. During 2009 and 2010, 87 demonstrations were conducted for different improved machines with participation of 3378 farmers, and 8 trainings were organized for 171 farmers. Post harvest technology machines were exhibited in 5 no. of farmers fair. During the period, fabrication of 25 prototypes was arranged and supplied to various agencies with total revenue of Rs 5.60 lacs. Rs. 1, 07951/- has been realized by selling of different processed products from college APC. A revolving fund project (Rs. 1.00 lacs) is also being operated since March, 2009. Besides this, a DST funded project "Demonstration and popularization of value addition and processing of garlic in production catchments" for Rs. 17 lakh for 3 years has been obtained.

INVESTIGATION NO. 2

Project Title: Compendium on proven post harvest technologies from R&D institutions as well as those commercially available

Investigators: B. K. Mishra, N.K. Jain, V.D. Mudgal and K.C. Sharma

Objectives:

1. To compile information on proven post harvest technologies from R & D institutions as well as those commercially available

Progress:

The information on proven post harvest technologies from university departments working on PHT was compiled and sent to PC-PHT. The information on proven post harvest technologies from commercial manufacturers was collected through address available on internet. The State of Rajasthan has very few manufacturers dealing PHT machinery. Most of them are dealing with manufacturing of floor mill. The process machinery is being supplied by vendors after procuring from nearby states like Gujarat, Delhi and UP.

INVESTIGATION NO. 3

Project Title: Status of agro-processing industries in Rajasthan state.

Investigators: K.C.Sharma, V. D. Mudgal and N.K. Jain

Objectives:

1. To survey the status of agro-processing industries of the state
2. To compile success stories of 10 no. of agro-processing industries in the state

Progress:

Ten small scale agro processing industries were surveyed to work out the present status of processing. Initially four success stories of agro processing were reported, among them, one success stories on aloe vera were displayed on the web page of ICAR as "Tribal earn respectable income from aloe vera processing". The remaining six success stories of agro processing are under compilation.

INVESTIGATION NO. 4

Project Title: Impact Assessment of Technologies Developed under AICRP on PHT

Investigators: K.C.Sharma, N.K. Jain, V.D.Mudgal and Sunil Kumar

Objectives:

1. To estimate the economic viability of post harvest technologies developed under AICRP on PHT
2. To evaluate the impact of post harvest technology on income, employment and sustainable livelihood (assets and vulnerability) through production and marketing of prototype/ product
3. To assess the possible impact on household food and nutritional security
4. To study the socio economic factors that influence the adoption of post harvest technology.

Progress:

Impact assessment of proven technologies viz. Maize dehusker sheller, garlic bulb breaker, garlic dehydration technology, ginger dehydration unit and aloe vera juice making unit has been done based on performa supplied by PC unit.

INVESTIGATION NO. 5

Project Title: Development of maize based extrusion cooked and ready to eat products

Investigators: N.K. Jain, Sunil Kumar and K.C.Sharma

Objectives:

1. Evaluation, adoption and refinement of existing extruders
2. Development and standardization of maize based ready to use products
3. Nutritional, shelf life and packaging studies on the products.
4. Cost economics of the process & technology

Progress:

Work could not be initiated as the desired extruder was not commissioned so far under the project, besides functional trouble in an extruder available in the Department of Food & Nutrition, College of Home Science, MPUAT, Udaipur.

INVESTIGATION NO. 6

Project Title: Management of pulse beetle, *Callosobruchus maculatus* L. through custard apple (*Annona squamosa* L.) plant derivatives

Investigators: K.C. Sharma, Sunil Kumar and N.K.Jain

Objectives:

1. To study the effect of plant products against pulse beetle.
2. To study the nutritional and molecular-profile of healthy, infested and treated pulses.
3. To conduct field level trial and evaluate effect of treatments on the germination and characteristics of the stored pulses

Progress:

The acetone and ethanol extracts of leaf, bark and seed powder were prepared and evaluated against the pulse beetle. The extracts were evaluated for adult mortality, fecundity, egg hatch inhibition and germination of pigeon pea seeds. The maximum mortality (93.33 %) was observed in acetone extract of seed followed by leaf extract (86.67 %) and bark extract (66.67 %) while similar trend was in the ethanol extract of leaf, bark and seed up to 72h. The fecundity decreased with the increase in the concentration of both extracts. The maximum deterrence (90.90 %) was reported in the acetone extract of seed followed by leaf (72.73 %) and bark (59.09 %) extract at 4 % concentration. The ethanol extract was found

less effective as compared to acetone extract in reducing the fecundity. The maximum hatching inhibition was recorded in acetone extract of seed (86.77 %) followed by leaf extract (48.31 %) and bark extract (35.00 %). The deterrency per cent increased with the increase in the concentration of both the extracts. The acetone extract was found more effective in terms of adult mortality, fecundity reduction and egg hatch inhibition as compared to ethanol extract. Reduction in the total protein, total carbohydrate, pH, test weight, reducing sugar and vitamin A and increase in the free fatty acids, titrable acidity has been observed for damaged pigeon pea seeds as compared to healthy and treated seeds. No harmful effect of acetone and ethanol extracts of leaf, bark and seed on germination of pigeon pea seeds was observed up to 180 days of storage.

Adoptive trial on safe storage of pulses using sand layer: On the basis of monthly observation recorded on the pigeon pea seeds stored in plastic bin by placing a 3 cm sand layer after extended sun drying over the grain surface revealed that no insect infestation, no reduction in weight loss and no adverse effect on the germination of seed was found as compared to control.

INVESTIGATION NO. 7

Project Title: Development of continuous type grain pearler cum polishing machine

Investigators: N.K. Jain, Sunil Kumar and K.C.Sharma

Objectives:

1. Evaluation, adoption and refinement of existing abrasive roller of dhal mill for grain pearling/deawning.
2. Development of integrated machine for grain cleaning, pre treatment and pearling and deawning.
3. Cost economics of the process and technology.

Progress:

A machine has been developed for multiple uses viz. dhal milling, grain pearling/polishing and deawning of coriander. The machine consists of an abrasive tapered roller, an aspirator, separation sieve box, mixer/conveyor, oil/water tank and 1.5 kW single phase motor. The machine costs Rs 40,000/= (inclusive motor) with capacity of 75 kg/hr. The cost of operation is Rs 100/q for dhal milling, and Rs 70/q for deawning and pearling/polishing. Maximum efficiency for pigeon pea milling as 76%, maize pearling as 91-93%, wheat pearling as 93-96% and coriander deawning as 82% could be obtained at different rotor speed viz. 864, 600, 900 and 200 rpm respectively. The unit can be utilized for grading of grains and imparting oil/water pretreatment.

INVESTIGATION NO. 8

Project Title: Replacement of existing hook system (kundi) for minimizing the pilferage losses during handling / lifting of bags in markets/warehouses/godowns

Investigators: K.C.Sharma, N.K. Jain and Sunil Kumar

Objectives:

1. Replacement of existing hook system (kundi) for minimizing the pilferage losses during handling/lifting of bags in markets/warehouses/ godowns.

Progress:

Considering utilization of existing hook system for lifting of bag and without making any major change in handling style, an eye system was envisaged. One eye on diagonal corner (total two nos.) on 50 kg capacity gunny bag can easily check pilferage losses due to tearing of bag while making direct insertion in bag. The eye was made using MS circle of 26 g. The eye was fixed in the corner of bag using canvass strip and rivets. The two ends of a corner were fixed together to give proper grip and strength to eye hole. A 12 mm hole was made to insert the hook for lifting and handling. The bags with eye holes were evaluated with local farm labourer and reported satisfactory. The total cost of eye making per bag has been estimated as Rs 20 /=-.

INVESTIGATION NO. 9

Project Title: Development of Aloe gel extractor
Investigators: N.K. Jain, Sunil Kumar, K.C.Sharma and B.K.Mishra
Objectives:

1. Development of rural level peeling, pulp extraction and product development technology from aloe-vera
2. Nutritional, shelf life and packaging studies on the products .
3. Cost economics of the process & technology

Progress:

A motorised small scale gel extraction machine has been developed by the MPUA&T, Udaipur centre under AICRP on PHT. The machine has capacity for extracting 40-50 kg per hour gel/filets of Aloe vera with 91-94 % gel recovery. Process for value added products such as aloe vera juice, squash and RTS beverage has been standardized by Udaipur centre with / without blend of lemon, ginger and mint extracts. Udaipur centre imparted training to the members of a SHG, *Van Suraksha evam Prabandh Samiti*, Village - Atatiya, Range - Oгна, District - Udaipur (Rajasthan state) functioning under the Department of Forest, Govt. of Rajasthan. After successful training at PHT centre, the member of the SHG along with Forest Department officials have established the *Gwarpatha Prasanskaran Kendra* (aloe vera processing unit) in Oгна village, launched by the District Collector, Udaipur along with Conservator of Forest at Sajjangarh Wildlife Sanctuary, Udaipur on 4th February 2009 for sale of Aloe vera juice to general public and tourist as a health drink.

Total cost of production of aloe vera juice by this unit is Rs. 40 per litre with sale price as Rs. 100 per litre, with a net profit of Rs. 60 per litre. The low sale price has been fixed after considering the prevailing market price of Rs 200-550 per litre juice. Local tribals and members of *Van Suraksha evam Prabandh Samiti* are earning profit by sale of aloe vera juice. During November 2009 to January 2010, the group handled approximately 4 tonnes of aloe leaf and produced 950 litres of aloe juice and a net profit of Rs 64,000 has been realized for the duration. This Aloe vera processing unit is providing employment to 8 persons/day.

INVESTIGATION NO. 10

Project Title: Development of baked, fermented and non-fermented products from Mahua flower

Investigators: B. K. Mishra, N.K. Jain, Sunil Kumar and K.C.Sharma

Objectives:

1. To develop value added non- fermented products from mahua flowers
2. To develop nutraceutical wine from mahua flowers through ethanol fermentation
3. To work out cost economics for the developed products and technology

Progress:

Fermentation study was conducted in 250 ml Erlenmeyer flasks on different conditions of pH (4, 4.5 &5), temperature (25 & 30 C) and duration (7, 14 & 21 days). Higher ethanol was obtained at 30°C temperature with pH 4.5 and 7 days period of fermentation but it was not selected due to presence of higher titrable and volatile acidity. Scale up of Mahua flower juice fermentation was conducted under optimized condition (25°C, 4.5 pH and 7 days) in batch type fermentor (3.5 lit capacity) resulted in to alcoholic beverage with 9.82% ethanol which may used as a wine after proper aging and clarification.

Non-fermented mahua RTS was standardized from the dried mahua flowers and its shelf-life was estimated. The pH decreased from 5.6 to 3.3 in case of RTS blended with ginger @ 10 per cent after five months of storage at ambient while it decreased to 4.5 in case of refrigerated condition. The total soluble solids decreased from 17.5 to 14.3 °Brix at ambient and 16.2 °Brix at refrigerated storage of mahua RTS blended with ginger. Mahua flower juice was used as sugar substitute in making biscuits from maida and organoleptic scoring against control were found better in taste with aroma of dried mahua flowers.

INVESTIGATION NO. 11

Project Title: Development of protocol for production and application of microbial pectinases in fruit processing

Investigators: Sunil Kumar, N. K. Jain, B.K. Mishra and K. C. Sharma

Objectives:

1. Quantitative screening of procured pectinolytic strains of bacteria and fungi from various agencies.
2. To purify and characterize pectinases for physiochemical, kinetic and regulatory properties
3. To standardize the fruit juice clarification protocol using concentrated enzyme(s)

Progress:

Twelve pectinolytic strains of fungi were procured from culture collection centers in India and five strains were isolated from decaying fruits like coconut and jamun. The cultures were grown on a selective medium (pectin 1%, yeast extract 0.1%, pH 7.0, and temperature 35°C) for production of pectinolytic enzymes under submerged fermentation. After incubation time of 8 days, culture filtrate was analyzed for pectinmethyl esterase (PME), exo- and endo-polygalacturonase (PG) enzymes activities (all belonging to a group named pectinase) and parameters like reducing sugar, soluble protein and biomass were also recorded. A strain (MPUAT-2), isolated from coconut hull dipped in distilled water at 35±2°C, was found to be a good pectinase producer. The strain was optimized for higher yields of enzyme for media parameters and found optimum conditions as: pH 8.0, orange peel 3%, yeast extract 0.1%, incubation time 5 days, temperature 35°C. The strain has been submitted with IMTECH, Chandigarh for phenotypic characterization.

The optimized enzyme filtrate was tried for fruit juice clarification in case of mausambi and aloe vera juice. Five ml of crude enzyme was mixed with 100 ml of juice at 20°C for a holding time of 5 h. The effect on juice clarification was compared with a purified commercial enzyme source, 35 units of which were added in 100 ml of juice. A control (without enzyme) was also run for comparison. The effect in the form of sediment at bottom of juice was clearly visible (cf. control). The sediments were removed using centrifugation, filter paper, normal sieve and cotton plug. The effect of cotton plug and filter paper yielded crystal clear juice.

INVESTIGATION NO. 12

Project Title: Development of gadgets for garlic clove grading, dry peel remover and improved fresh clove peeler

Investigators: N.K. Jain, Sunil Kumar and K.C.Sharma

Objectives:

1. Development and evaluation of garlic clove grading and peel removing machine from dehydrated flakes.
2. Functional testing of machine and compatibility evaluation with already developed machines for garlic processing.
3. Nutritional, shelf life and packaging studies on the dehydrated products.
4. Cost economics of the process and technology.

Progress:

Garlic grading machine has been developed to grade 100 kg/h garlic bulb on diameter basis. The machine consists of a rotary frame for mounting two sieves, an aspirator, a hopper and bottom discharge troughs for collection of graded material. As per Agmark specs. rules 2004 (<http://agmarknet.nic.in/fveggmrules04.htm#garlic>), the screen for machine was developed to separate garlic bulb in grades viz. less than 30 mm, between 30-40 mm (Class I & II) and more than 45 mm dia size (Extra class). The machine is operated by 1 hp single phase motor and costs Rs 35000/- with cost of grading as Rs 30 per q resulting in saving of almost 200 % cost over conventional practice.

A dry garlic clove peel remover machine with capacity of 50 kg/h was developed to detach and separate peel from dehydrated garlic flakes. The machine consists of a scrubber made of canvass strips which rotates in a barrel. The peels get detached of due to abrasion

and friction and an aspirator sucks the light peel and dehydrated clove/flakes is obtained through the discharge trough. The machine is operated by 1 hp single phase motor and costs Rs 17000/= with cost of unit operation as Rs 53 /q dry flakes resulting in saving of almost 300 % in cost over conventional practice. The nutritional and compositional analysis of dehydrated products has been completed.

INVESTIGATION NO. 13

Project Title: Adaptive trials on :
Bengal gram depodder from Jabalpur centre
Minimal processing of vegetables from CIPHET
Pomegranate aril extractor from CIPHET

Investigators: Sunil Kumar, N.K. Jain, V. D. Mudgal and K.C.Sharma

Objectives:

1. Performance of selected improved post harvest technologies /equipments
2. To modify /refine the same (if required) to suit the local needs.
3. To conduct adoptive trial and demonstration for popularization of same in production catchment.
4. To impart training to farmers /entrepreneurs for effective management of improved technology.

Progress:

None of machine/technology could not be procured In spite of repeated efforts.

**Central Sector Scheme on
Post Harvest Technology and Management
(CSS-PHTM)**

Central Sector Scheme is one of the thrust area approved by Prime Minister's Office (PMO) for Reforming 'Agricultural Markets' and Promoting 'Post Harvest Technology'. Keeping in view Department of Agriculture and Cooperation has taken up a new scheme (CSS-PHTM) to promote Post Harvest Technology for implementing during the XI Five Year Plan. The Central Sector Scheme aims to focus on lower end of the spectrum of Post Harvest Management. The centres under AICRP on PHT have taken up Central Sector Scheme for the benefit of the farmers and primary processors. This scheme consist of i) Establishment of units for transfer of primary processing technology, value addition, low cost scientific storage, packaging units and technologies for by-product management (Component-1), ii) Demonstration of Technologies (Component-3), iii) Training of Farmers, Entrepreneurs and Scientists (Component-4).

**Proposed List of APCs for Establishment during 2009-10
under Central Sector Scheme : Component 1**

Sr. No.	Name of AICRP Centre	Proposal submitted	Total Project Cost (Rs. Lakh)	Subsidary (@ 20% Rs. limited to 4 lakh) Rs
1.	PDKV Akola	1	4.50	180000
2.	VPKAS Almora	2	20.0	600000
3.	OUAT Bhubaneswar	1	6.00	240000
4.	RAU Jaipur	1	3.51	140400
5.	JAU Junagadh	1	0.80	32000
6.	GBPUAT Pantnagar	2	5.42230 = 5.42200	476880
7.	IGKV Raipur	1	3.50	140000
8.	CTCRI Trivandrum	1	11.58	400000
9.	MPUAT Udaipur	1	9.85	394000
	Total	11		2603280

TOTAL SUSIDY: Rs. 26,03,280/-
(Rupees twenty-six lakh three thousand two hundred and eighty only)

**Proposed List of APCs for Establishment during 2010-11
under Central Sector Scheme : Component 1**

Sr. No.	Name of AICRP Centre	Proposal submitted	Total Project Cost Rs. Lakh	Subsidary (@ 20% Rs. limited to 4 lakh) Rs
1.	RARS, Anakapalle	1	3.97	158800
2.	AAU Jorhat	1	3.792	115168
3.	JAU Junagadh	1	13.00	400000
4.	UAS, Raichur	1	3.80	152000
5.	YSPUH&F, Solan	1	4.60	400000
6.	SKUAS&T Srinagar	3	74.049	1200000
7.	KAU, Tavanur	1	20.53	400000
8.	RAU, Pusa	1	8.78	351200
	Total	10		3177168

TOTAL SUBSIDY : Rs. 31,77,168/-
(Rupees thirty one lakh seventy seven thousand one hundred and sixty eight)

**Grants received for Central Sector Scheme for Demonstration and Training
(Component 3 and 4)**

Financial Year	Receipts (in Rs.)	Disbursal (Rs.)		Remarks
		Amount	Date	
2008-09	40,00,000/-	36,58,000	23.01.09	Demo 14 centres (Akola, Almora, Bangalore, Bhubaneswar, Coimbatore, Hisar, Jabalpur, Junagadh, Ludhiana, Pantnagar, Trivandrum, Udaipur, Raichur, Kasargod)
2009-10	58,18,000/-	2,07,500/-	6.11.2009	Demo 4 centres (Trivandrum, Udaipur, Kasargod, Raichur)
		21,44,000/-	30.12.2009	Training 9 centres (Akola, Aligarh, Almora, Bangalore, Bhubaneswar, Coimbatore, Hisar, Pantnagar, Udaipur)
		29,59,000/-	31.12.2009	Demo 12 centres (Akola, Almora, Bangalore, Bhubaneswar, Coimbatore, Hisar, Jabalpur, Junagadh, Ludhiana, Pantnagar, Trivandrum, Udaipur)
		7,15,000/-	07.01.2010	Training 4 centres (Kolkata, Raichur, Solan, Tavanur)
2010-11	NIL	71,837/-	11.08.2010	Training by PC(PHT) unit at CIPHET, Ludhiana
		62,663/-	10.08.2010	Training (Lucknow)
TOTAL	98,18,000/-	98,18,000/-		Unspent Balance – NIL

**ALL INDIA COORDINATED RESEARCH PROJECT ON
POST HARVEST TECHNOLOGY**
Central Institute of Post Harvest Engineering and Technology
PAU Campus, Ludhiana - 141 004

PROGRAMME FOR THE 28th WORKSHOP

Venue : Central Institute of Agricultural Engineering, Bhopal
Dates : 28-31 October 2010

28 October 2010 (Thursday)

09:00-09:30 : Registration

09:30-11:00 : **INAUGURAL SESSION**

09:30 - 09:35 : Welcome address – Dr. P. Chandra, Director, CIAE
09:35 - 09:55 : Coordinator's Report
09:55 - 10:00 : Remarks of Dr. K.K. Singh, ADG (Process Engg)
10:00 - 10:05 : Remarks of Dr. R.T. Patil, Director, CIPHET
10:05 - 10:15 : Release of new publications (by Chief Guest & Chairman)
10:15 - 10:35 : Address by Chief Guest (Dr. B.S. Bisht, VC, GBPUA&T, Pantnagar)
10:35 - 10:55 : Address by Chairman – Dr. M.M. Pandey, DDG (Engg)
10:55 - 11:00 : Vote of thanks - Dr. S.D.Kulkarni, PD, APPD, CIAE, Bhopal

Rapporteurs : Dr. U.K. Nidoni, Research Engineer, UAS, Raichur
Er. K.P. Singh, Research Engineer, VPKAS, Almora

11:00 - 11:15 : Tea

TECHNICAL SESSION – I : **Presentation of Annual Progress Reports 2009 - 2010**
11:15-13:30 (Centres: Akola, Almora, Bangalore, Bapatla, Bhopal, Bhubaneswar and Coimbatore)

Chairman : Dr. M.M. Pandey, DDG (Engg), ICAR, New Delhi
Co-chairman : Dr. K.K. Singh, ADG (PE), ICAR, New Delhi

Coordinator : Dr. S. K. Nanda, P.C., AICRP on PHT, CIPHET, Ludhiana
Rapporteurs : Dr. N. K. Jain, Research Engineer, MPUA&T, Udaipur
Dr. Ravi Gupta, Research Engineer, CAU, Gangtok

(The Research Engineers/PI of the cooperating centres to present the salient Progress Report of their centres from the last workshop to till date. The presentation should be limited to 15 minutes for each centre including discussion).

13:30-14:30	:	Lunch
14:30-17:30	:	Technical Session – I continued (Centres: Faizabad, Gangtok, Hisar, Jabaipur, Jaipur, Jodhpur, Jorhat, Junagadh, Kasargod and Kharagpur)
Rapporteurs	:	Dr. H. Naik, Research Engineer, SKUAST, Srinagar Dr. Ajay Verma, Research Engineer, IGKVV, Raipur

29 October 2010 (Friday)

(9:30-12:30)	:	Technical Session – I continued (Centres: Ludhiana, Pantnagar, Pusa, Raichur, Raipur, Ranchi, Solan, Srinagar, Tavanur, Trivandrum and Udaipur)
Chairman	:	Dr. P. Chandra, Director, CIAE, Bhopal
Co-chairman	:	Dr. M.K. Khan, Dean, OUAT, Bhubaneswar
Coordinator	:	Dr. S. K. Nanda, P.C., AICRP on PHT, CIPHET, Ludhiana
Rapporteurs	:	Dr. Ch. V.V. Satyanarayana, Res. Engineer, ANGRAU, Bapatla Dr. V.Palanimuthu, Research Engineer, UAS Bangalore

TECHNICAL SESSION – II: Impact Assessment of Technologies Developed under AICRP on PHT by PC Unit

12:30 – 13:30	:	
Chairman	:	Dr. S.D.Kulkarni, PD, APPD, CIAE, Bhopal
Co-chairman	:	Dr. R. K. Gupta, Head, HCP, CIPHET, Abohar Campus
Coordinator	:	Dr. S. K. Nanda, P.C., AICRP on PHT, CIPHET, Ludhiana
Rapporteurs	:	Dr. D.K. Sharma, Research Engineer, CCSHAU, Hisar Dr. K.P. Singh, Research Engineer, VPKAS, Almora

13:30 -14:30 : Lunch

TECHNICAL SESSION - III: Presentation of Annual Progress Reports 2009 – 2010 – Livestock Produce
(Centres: Aligarh, Chennai, Khanapara, Kolkata, Mangalore, Mumbai, Raichur)

Chairman	:	Dr. T.K. Srinivasa Gopal, Head, Fish Processing Division, CIFT
Co-chairman	:	Prof. Ashish Paturkar, Sectoral PI (Livestock Produce), Mumbai
Coordinator	:	Dr. S. K. Nanda, P.C., AICRP on PHT, CIPHET, Ludhiana
Rapporteurs	:	Dr. R. N. Borpujari, PI/Research Engineer, AAU, Khanapara Dr. C.V. Raju, PI, KVA&FSU, Mangalore

TECHNICAL SESSION – IV:
(16:00 - 17:30)

**Presentation of Annual Progress Reports 2009 – 2010
– Jaggery & Khandsari**
(Centres: Anakapalle, Buralikson, Kolhapur, Lucknow,
Pantnagar)

Chairman	:	Dr. D.C. Joshi, Dean, AAU, Anand
Co-chairman	:	Dr. Jaswant Singh, Sectoral PI (J&K), Lucknow
Coordinator	:	Dr. S. K. Nanda, P.C., AICRP on PHT, CIPHET, Ludhiana
Rapporteurs	:	Dr. P.K. Omre, ARE, GBPUA&T, Pantnagar Dr. G.S. Nevkar, Research Engineer, RS&JRS, Kolhapur

30 October 2010 (Saturday)

TECHNICAL SESSION – V :
(09:30 - 13:30)

**Presentation of Technical programme for 2011 – 2012
(Sector : Food Grains & Oilseeds Processing)**

Chairman	:	Dr. B. Baboo, ND, NAIP, ICAR, New Delhi
Co-chairman	:	Dr. V.K. Sehgal, Sectoral PI (Food Grains), Ludhiana
Coordinator	:	Dr. S. K. Nanda, P.C., AICRP on PHT, CIPHET, Ludhiana
Rapporteurs	:	Dr. M.S. Sajeev, Research Engineer, CTCRI, Trivandrum Dr. Anupama Singh, RE, GBPUA&T, Pantnagar

(The Sectoral PI will present an overview of the projects and Research Engineers/PI of the cooperating centres to present the detail Technical Programme of research projects proposed to be undertaken during the years 2011-2012).

13:30 - 14:30 : **Lunch**

TECHNICAL SESSION–VI:
(14:30-17:30)

**Presentation of Technical Programme for 2011 – 2012
(Sector : Horticultural Crop Processing)**

Chairman	:	Dr. R.P. Kachru, Ex. ADG (PE), ICAR, New Delhi
Co-chairman	:	Dr. R.T. Patil, Director, CIPHET, Ludhiana
Coordinator	:	Dr. S. K. Nanda, P.C., AICRP on PHT, CIPHET, Ludhiana
Rapporteurs	:	Dr. K. K. Jain, Research Engineer, JAU, Junagarh Dr. V. Palanimuthu, Research Engineer, UAS, Bangalore

31 October 2010 (Sunday)

TECHNICAL SESSION – VII:
(09:30 – 11:00)

**Presentation of Technical Programme for 2011 – 2012
(Sector: Livestock Produce Processing)**

Chairman	:	Dr. N.K. Kondaiah, Director, NRC on Meat, Hyderabad
Co-chairman	:	Dr. R.K. Goyal, N.C., NAIP (C-4), ICAR, New Delhi

Coordinator : Dr. S. K. Nanda, P.C., AICRP on PHT, CIPHET, Ludhiana
Rapporteurs : Dr. Vidhan Singh, Research Engineer, CPCRI, Kasargod
Er. A. Borah, Research Engineer, AAU, Jorhat

**TECHNICAL SESSION – VIII : Presentation of Technical Programme for 2011 – 2012
(11:00 – 12:00) (Sector: Jaggery & Khandsari)**

Chairman : Dr. P.K. Srivastava, Dean, COAE, Gangtok
Co-chairman : Dr. D.V.K. Samuel, Head, Agril. Engg Divn, IARI, New Delhi

Coordinator : Dr. S. K. Nanda, P.C., AICRP on PHT, CIPHET, Ludhiana
Rapporteurs : Dr. Mohan Singh, Research Engineer, JNKVV, Jabalpur
Dr. P.K. Malviya, Research Engineer, CAZRI, Jodhpur

**TECHNICAL SESSION-IX : Presentation of Progress in implementation of Central
(12:00 – 13:00) Sector Scheme on PHT & management**

Chairman : Dr. R.T. Patil, Director, CIPHET, Ludhiana
Co-chairman : Shri Omkar Singh, DOAC

Coordinator : Dr. S. K. Nanda, P.C., AICRP on PHT, CIPHET, Ludhiana
Rapporteurs : Dr. Shanti Mary Mathew, Research Engineer, KAU, Tavanur
Dr. R.P. Tiwari, Research Engineer, NDUAT, Faizabad

13:00 - 14:00 : Lunch

**TECHNICAL SESSION-X : Business Session
(14:00 – 15:00)**

Chairman : Dr. K.K. Singh, ADG (PE), ICAR, New Delhi
Co-chairman : Dr. P.C. Sharma, Sectoral PI, Solan

Coordinator : Dr. S. K. Nanda, P.C., AICRP on PHT, CIPHET, Ludhiana
Rapporteurs : Dr. S. Patel, Research Engineer, IGKVV, Raipur
Dr. V.B. Kalmegh, Research Engineer, PDKV, Akola

(Research Engineers of the centres will present the salient features of the functioning of their centres, and functional problems, if any).

15:00-16:30 : PLENARY SESSION

Chairman : Dr. M.M. Pandey, DDG (Engg), ICAR, New Delhi
Co-chairman : Dr. K.K. Singh, ADG (PE), ICAR, New Delhi

Coordinator : Dr. S. K. Nanda, P.C., AICRP on PHT, CIPHET, Ludhiana

Rapporteurs : Dr. Sreekanta Sarkar, Research Engineer, WBUA&FT, Kolkata
Dr. A.K. Dixit, Sr. Scientist, PC-Unit, CIPHET, Ludhiana

(In this Session, recommendations of different sessions will be read out by the Rapporteurs and comments invited. It will be followed by concluding remarks of chairpersons).

Vote of thanks : Dr. S. D. Deshpande, Research Engineer, CIAE, Bhopal

(S. K. NANDA)
Project Coordinator
AICRP on PHT

