# Attachment A

Main research and development achievements of Ukrainian food scientists (Mostenska, 2014):

PEF technology

-Low-Intensity Food Processing combined with pulsed electric field technology (extraction, pressing, drying, microbial inactivation)

-Mathematical modeling of electrical treatment of beetroot stuff and improvement of the process of sugar extraction

-Pulsed electric field treatment of apple tissue during compression for juice extraction (in cooperation with Compiegne Technological University (France))

-*Escherichia coli* inactivation in liquid whole egg using combined PEF and thermal treatments (in cooperation with McGill University (QC, Canada)

-Diffusion juice cleaning by electro-floatation and electro-coagulation applied in sugar from sugar-beet technology

Food loss reduction

-Implementation of high-performance technology for grain cleaning of the harvested crop and improvement of the technology of existing grain separators

-Determination of gel-like food product consistency by the method of gravitational penetration

-Adhesive conveyor (solving the problem of vertical transportation of sticky fluid materials)

-Hydrolysis of biopolymers of hard-to-ferment grain raw materials

-Directions of rational use of hops in beer production

-Disposal of post-alcohol grain bard

-Flour sifter with pneumatic flour supply

-Comprehensive improvement of the production of baked goods

-Intensification of processes and improvement of equipment for kneading and extruding yeast dough

-Production of bioethanol at a sugar factory

-Adsorption purification of apple juice with natural minerals

-Resource-saving technologies of milk whey processing

-Resource-saving technologies of dairy-protein products with grain ingredients

-Resource-saving technologies of spreads with fillers

-Scientific and practical aspects of improvement of traditional methods and development of new technologies of meat products from non-traditional meat raw materials (deer, roe deer, wild boar, ostrich, nutria, hare, game birds): production of minced and delicatessen products, sausage and culinary products and semi-finished products

-Technology of meat products for special nutrition using cultivated mushrooms: champignons, mushrooms, shiitake and mushroom biomass (*Pleurotusostreatus*)

-Technology of salted meat products using multifunctional colloidal brine systems

-Technologies of mushroom semi-finished product and its use in combination with meat products

-Improvement of soybean malt technology

-Bakery products of increased biological value with the use of food lupine processing products

-Technology of "light" buckwheat grains

-Fruit fillings made according to the latest technologies with the use of non-traditional vegetable raw materials

-Production of phyto-oil semi-finished product as a base for emulsion-type sauces

New extraction methods for biomass recovery or separation technologies

-Obtaining a solution by electro-membrane method for the extraction of pectin from vegetable raw materials

-Effective pectin technology from sugar beet roots

-The influence of electromagnetic radiation on the accumulation of biomass and by-products of fermentation by irradiated yeast

-Decanter for post-alcohol bard separating into filtrate and wet concentrate

-Development of the technology of grain extract from triticale

-Use of cavitation for preparation of grain raw materials for fermentation

-Innovative technology of low-temperature hydrothermal and thermo-fermentative processing of grain raw materials in alcohol production

-Socio-economic and technological aspects of hydrocarbon-containing raw material processing into fuel ethanol (bioethanol)

-Development of technology and equipment for the production of essential oil using membrane technologies

-Hydrodynamic cavitation devices for aerating of fish hatcheries

-Continuous and batch vibrating extractors for the processing of plant raw materials and their waste

-Methods of production of dyes based on root crops and table beet pulp

-Technologies for obtaining bio-antioxidants from the green mass of plants

-The method of separating essential oils into narrow fractions and individual aromatic substances

-Production of bakery products using an increased amount of soybean processing products

-Production of bakery products using sugar-containing raw materials

-Production of food concentrates based on edible mushrooms

-Innovative technologies of fudge-cream and whipped candies using semi-finished products from grape pomace

-The method of production of maltodextrin

-Technology of fructose-containing food syrup from wheat raw materials

Improvements of food attributes

-Technology of pectin-containing foods for preventive nutrition in environmentally hazardous areas (including radiation)

-The technology of vermouths using spicy and aromatic raw materials from the Transcarpathian region

-Bakery products with an increased content of complete protein

-Bakery products with increased mineral value

-Composite mixtures for the production of bread with a balanced chemical composition

-Technology of sunflower oil of increased biological value

-High-quality drinking water preparation technology (chlorine-free, coagulant + flocculant)

-Extruded potato products

-The method of production of soft salted cheese

-Technology of concentrated juices and drinks with aroma preservation (adsorption capture of aromatic substances from secondary steam juices or extracts)

-Technology of butter enrichment with carrot powder

-Development of equipment for flow saturation of beverages with carbon dioxide

-Technology of carotene-containing fortifiers from carrots

-Improving the technology of canned products using pumpkin extract

-Ice cream with sugar substitutes

-Canned condensed milk with sugar substitutes

-Production of functional types of butter and oil pastes

-Condensed milk preserves with sugar and fruit and berry fillers

-Production of a protein-mineral fortifier for herodietic purposes and its use in the production of cooked sausages

-Enrichment of meat products with trace elements due to the use of seaweed and the study of the effect of heat treatment on the content of trace elements

-Technology of concentrated juices and drinks with preservation of aroma

-Production of dietary wheat bread using Kosmol dry milk product

-Anti-anemic bakery products

-Production of gluten-free muffins based on rice, buckwheat, corn flour for celiac patients

-Pasta products with dry egg white

-Production of protein creams with reduced calories

-Rational use of new generation sugar substitutes in the production of marshmallows, which can be consumed by all population groups, including those with diabetes

-Gluten-free bread for patients with celiac disease and phenylketonuria

-Production of fruit fillings for high-temperature co-extrusion products using composite structure formers of various natural origins

-Production of breakfast cereals based on cereals and food fibers of sharp natural origin

-Protein-grain bread

-Production of bread based on high yield wheat flour

-Production of bread using sprouted wheat grain

-Technology of bread from wheat flour and hops

-Technology of preventive pasta products enriched with dietary fibers of wheat grain

-Innovative technologies of biscuits using low-glycemic sugar substitutes

Food safety

-Massagers for intensive salting of meat

-A device for controlling the ripening of hard cheeses and determining their quality

-Automation system for periodically operated sterilizers

-Microprocessor control systems for technological processes of food production

-Conveyor meat cutting machine

-Vibrating sifter of loose materials

-The thick foam dispenser operates periodically

-Universal baking oven K-PHM-2

-Baking oven KhPC-16

-Bread cutting machine

-A machine for breadcrumb slicing

-Device for packing viscous products in a container

-The module for capturing and opening flat-folded cardboard blanks with an active guide

-Improvement of the technology of drinks from whey treated by electric discharges

-The technology of cooked sausage products using bone paste, obtained in the BA-100 electromagnetic apparatus

-Bakery products with an extended shelf life

-Improvement of the technologies of unglazed fondant and milk candies in order to extend their shelf life

-Method of heat treatment of dry egg products and their analysis using IR spectroscopy

Enhancement of sugar production

-Industrial crystallization of sucrose. Continuous vacuum pan for sugar factories (awarded by the State Prize of Ukraine)

-Development of the algorithm and cyclogram of the centrifuge to improve the quality of the first massecuite at sugar factories

-Progressive preliminary liming of the diffusion juice with simultaneous liming and carbonation in the circulation circuit

-Method of purification of thick semi-products of sugar production

-Innovative technology for purification of diffusion juice using the complex reagent "Cross-5"

-The method of purification of diffusion juice using ammonium dihydrogen phosphate

-Purification of diffusion juice with an improved I saturation process

-Improvement of the technology of pre-defecation of diffusion juice with the separation of sediment of non-sugars before the main defecation

-A new method of carrying out defecosaturation

-Sectional apparatus for carrying out the main liming process

-The method of crystallization of sugar syrup of the last stage of crystallization

-Centering of transport systems and drives of inclined type diffusion devices

-Spraying two-section saturation apparatus

Advancement in production of alcohol

-Expanding the assortment and improving the quality of beer

-Progressive technologies of alcoholic fermentation in the production of ethanol from starch-containing raw materials

-Rectification technology in the mode of controlled cycles

-Technology of distillation of alcohol-containing fractions in the mode of controlled rectification cycles

-A device for removing moisture from beer wort and transporting it

-Design of column rotary rectification devices

-Restaurant-type mini-breweries

Biotechnologies

-Biotechnology of multifunctional microbial exopolysaccharide

-Intensification of microbial synthesis of practically valuable secondary metabolites

-A new technology for type I interferons

-Biotechnological method of processing biodiesel production waste into microbial surface-active substances for bioremediation of the environment

-Creation of the modern immunobiotics for the correction of secondary immunodeficiencies in common infections

-Using of selenium-enriched yeast and malt in food production

-The interaction of viral and polynucleotide inducers with the cell as a primary signal for the production of type I interferons

-Development of a high-speed bioreactor (methane tank) for the production of biogas on the post-alcohol bar

-Honey fermented drinks

-Hydrocyclone digester

Environmental safety

-Hydromechanical technologies and equipment for aeration and purification of natural, domestic and industrial wastewater

-Effective technology of surfactants *Rhodococcuserythropolis* IMB AC-5017 for cleaning the environment from oil pollution

-Technology of *Acinetobacter calcoaceticus* biosurfactants of a wide range of applications

-Bioconversion of industrial waste into multifunctional microbial surfactants

-Biotechnology of food industry wastewater treatment using of iron compounds

-Development of biodegradable packaging materials using clay-starch compositions

-Deammonizer of condensates

-Knife crusher for cutting PET bottles with simultaneous separation of the neck and bottom

-The method of cleaning wastewater generated after the processing of milk whey

Energy saving

-Scientific substantiation, development and implementation of resource- and energy-saving technology and equipment for alcohol rectification (awarded by the State Prize of Ukraine)

-Dynamic controller for saving energy resources and increasing performance

-Rotary dryer with a pre-fluidized layer

-Intensification of the mass transfer process in column apparatuses with cyclic phase movement

-Ways to save fuel consumption in bakery ovens

-A simplified method for determining heat transfer coefficients for boiling suspensions of organic origin (sugar scum)

-Energy plant that works on waste of organic origin

-Modeling of processes occurring during methanation in technological equipment to optimize the biogas production process

-Pyrolysis of organic raw materials in order to obtain gaseous, liquid and solid energy carriers

-Thermosyphon economizers and air heaters for power plants of small and medium capacity

-Heat exchanger with ring channels

-Thermal type DASP deaerators

-Implementation of energy-saving technologies of grain milling

-Intermittent vacuum device with heating steam distributor

Management and control system improvement

-Dynamic expert assessment of the management system of the biotechnological complex of food production under situational uncertainty

-Automated intelligent information and analytical system of technological monitoring of a food enterprise

-Automated system of synergistic management of technological processes of food plants

-Automation of coordination of technological subsystems of a sugar factory using situational management

-Development and use of simulation models for software debugging of programmable logic controllers

-Automated management of the technological complex of beer production

-A new approach to the development of information structure schemes in the design of integrated automated control systems

-Automated system for controlling the technological process of the bragorectification plant with a subsystem for correcting the technological regime

-Development and use of differential magneto-elastic primary measuring transducers in systems for automatic dosing of bulk materials

-Automated control system of the diffusion separation of the sugar factory

-Automated bread production management system with decision support subsystem

-The system of optimal control of the apparatus of periodic action for the cultivation of commercial baker's yeast

-Automated decision-making support system for choosing improvers of flour properties (of oxidizing, reducing, emulsifying and catalyzing action, as well as complex improvers)

-Decision support system for pasta production management

-Development of information support for decision-making in planning tasks of a multi-nomenclature food enterprise

-Methodology for determining wear resistance of sunflower oil press elements

-A computer program for simulating the work of the food department of a sugar factory

-The method of determining the optimal concentration of starch in relation to water

-Design of automated devices of various capacities for carrying out vacuum extraction for food production, processing industry and agriculture

-Precision parametric measuring transducers for the control of integral and differential parameters of the composition of transported substances