USDA's Foreign Agricultural Service (FAS) is seeking to identify U.S. universities willing to host English-speaking agricultural scientists from **Azerbaijan** and **Bulgaria** under the Norman E. Borlaug International Agricultural Science and Technology Fellowship Program (Borlaug Fellowship Program). These Fellows have been selected competitively based on research priorities, academic and work accomplishments, commitment to Borlaug Fellowship goals and leadership qualities. It is recommended that the program begin in **September 2011** however, priority should be given to a time that is appropriate for the Fellow's proposed topic of research. The program should last for a period of 8-12 weeks.

Each Fellow has specific research topic interests. Please find below a brief description of the Fellows' research/fellowship interest, educational and research background, and program goals. Click on the hyperlink for more details regarding each Fellow's expressed interest as indicated in his/her proposed action plan.

1. Fellow #1 (male-Azerbaijan)
    - Background: PhD in Plant Genetics (2009). Currently working as the Head of the cereal and legume plants laboratory and focused on wheat genetics. Studies genetic basis for drought and salt tolerance in wheat accessions. Has molecular biology background.
    - Main Objective: To screen wheat germplasm for rust resistance utilizing molecular markers. He has access to wheat germplasm in Azerbaijan for these studies.

2. Fellow # 2 (male-Bulgaria)
    - Background: PhD in Agri-economics (2004). Currently working as an Associate Professor at a research institution and focused on analyses of the implementation of agricultural and rural development policies.
    - Main Objective: To gain a better understanding of U.S. agricultural policy related to direct payments and other policy options as well as commodity market forecasting for tobacco and other commodities

3. Fellow #3 (female-Bulgaria)
    - Background: PhD in Sunflower Breeding (2008). Currently working as an Assistant Professor at a university and focused on genetics and breeding of sunflower and wild species for resistance to biotic and abiotic stress and oil content.
    - Main Objective: To combine traditional breeding with molecular methods through new methods such as mapping for desirable traits using SSR or RFLP
    - Also hoping to gain background in production of haploids and protoplast culture.
    - Available to complete fellowship beginning July-Sept 2012

4. Fellow #4 (female-Bulgaria)
    - Background: Masters in Veterinary Medicine (2000); Assistant Professor in university simultaneously pursuing PhD focused on microbiology and infectious diseases.
    - Objective: to gain additional experience in conventional microbiological methods and molecular methods for identification of bacteria causing veterinary diseases in cattle including mastitis and food borne pathogens such as *Listeria* and *Campylobacter*

5. Fellow #5 (female-Bulgaria)
    - Background: PhD in molecular biology (2002) followed by 4 year post doc; Assistant Professor in genetics department at university in Bulgaria; focused on rapeseed fatty acid composition and cytochrome P450 screening
    - Objective: to screen rapeseed cultivars using molecular (simple sequence repeat markers) and compositional analysis (Gas chromatography–mass spectrometry and Near-infrared spectroscopy) to select for composition and concentration of desirable fatty acids
    - Available Summer 2012 for 6 weeks program

Institutions may submit proposals to host more than one Fellow. Institutions interested in hosting one or more Fellows should submit a proposal following the guidelines below:

- Indicate the name of the institution and mentor applying to host the Fellow(s);
- Indicate the country, research interests and reference number of each Fellow;
- Provide a tentative action plan based on the Fellow's research proposal and action plan, including topics covered, field visits and other activities;
- Provide a summary of relevant institutional capabilities for hosting international scientists and policymakers in the proposed field;
- Briefly describe the research expertise and international experience of the mentor in the Fellow's field of interest;
- A 1-2 page curriculum vitae should be provided for mentors and other collaborating researchers involved in the proposed program. This is not included in the page count provided maximum noted below.
- Identify the expected skills or knowledge to be acquired by the Fellow at the end of the program;
- Complete a budget based on the attached template with budget notes justifying the budget. If attendance at the World Food Prize in Des Moines, Iowa in October, 2011 is feasible, the budget should include time and funding for the

Fellow to attend;

- Complete the following checklist on university administrative policies;
- **Include all components of the proposal in a single PDF document, and;**
- **Proposal, excluding the budget, should not exceed 3-4 pages. If more than one Fellow is requested, an additional two pages per fellow is permitted.**

Please submit the proposal, university administrative checklist and estimated budget via email to: **Catherine.chesnutt@fas.usda.gov and Lisa.Wendel@fas.usda.gov . FAS would like to receive all expressions of interest by June 6, 2011.**

Funding support will be provided through USDA as part of the Borlaug Fellowship Program. Bulgarian Borlaug Fellowships are funded in cooperation with the America for Bulgaria Foundation. For more information on the Borlaug Program, please visit our website at: http://www.fas.usda.gov/icd/borlaug/Borlaug.asp

The Norman E. Borlaug International Agricultural Science and Technology Fellowship Program aims to promote food security and economic growth by increasing scientific knowledge and collaborative research to improve agricultural productivity. This program targets promising young scientists and policymakers from developing or middle income countries. The Fellows spend 8-12 weeks in the United States and work one-on-one with a U.S. scientist in their field. The mentor coordinates the Fellow's training and in order to continue collaborative efforts, visits the Fellow's host country for 7-10 days within 6-12 months after completion of the training in the U.S.

During the program, the Fellows learn new research techniques, gain exposure to the latest scientific developments in various fields of agriculture, access fully-equipped laboratories and libraries, and learn about unique public-private partnerships that help fund agricultural research and science. Equally important, this program provides international scientists and policymakers with opportunities to establish long-term contacts with U.S. scientists and apply newly gained knowledge from U.S. institutions to their country's research and development programs.

The World Food Prize is awarded annually during the Norman E. Borlaug International Symposium in Des Moines, Iowa. This year the World Food Prize is scheduled for October 12-14, 2011. The USDA Borlaug Fellowship Program organizes a side-event each year which includes activities for Borlaug Fellows that provide important networking opportunities for Fellows and international agricultural researchers, policy makers and the non-profit sector. The following link provides more information about the World Food Prize Borlaug Dialogue: http://www.worldfoodprize.org/index.cfm?nodeID=25286.

Host University Administrative Checklist

Please fill out the following checklist concerning the university's policies on the administrative aspects of hosting a fellowship.

Host University Policies	YES	NO
Will all mentors listed in the proposal be present for the majority of the fellowship?		
Will the university be able to provide per diem within the first week of the Fellow's arrival?		
Will the university be able to provide fully furnished lodging with kitchen facilities?		
Does the university tax the participants' per diem and housing (if so, please include in the budget)?		

Annex

Fellow 1 (male-Azerbaijan)

Fellow's Background

1. I have graduated from the Azerbaijan State Agricultural University and have got master degree in 2003 on agronomy. In 2004-20081 was a PhD student in Genetic Resources Institute of Azerbaijan National Academy of Sciences and I have got my PhD degree on plant genetics in 2009. My PhD thesis was devoted to the assessment of drought and salinity tolerance in diploid and tetraploid wheat genotypes. Applied objectives were to identify drought and salt tolerant accessions among diploid and tetraploid wheat genotypes and to investigate the molecular genetic bases of their stress tolerance. The experiments were carried out on 12 wheat *species* and subspecies, including wild species, as *well* as on 41 durum wheat varieties. As a result of laboratory experiments based on changes in several physiological parameters under stress conditions, 14 out of S3 wheat genotypes were selected as highly tolerant to drought and salinity conditions. Genetic analysis was carried out on several genotypes, both tolerant and susceptible, in order to reveal differences linked to their genotype and response under unfavorable environmental conditions such as drought and salinity. It was determined that in tolerant individuals, the active genome part - labile chromatin DNA - increased which lead to the intensification of transcription and subsequently to much more RNA synthesis. In comparison, in susceptible varieties, the amount of RNA and all DNA fractions significantly decreased. Apparently, the increased intensity of transcription is resulting in the synthesis of stress tolerant proteins. Those data were confirmed by testing other accessions cultivated directly in irrigated, rain-fed and middle saline lands; the comparison was based on 8 yield criteria. Tolerance indices based on yield components and affecting wheat productivity were computed and accessions were classified for their stress tolerance. The laboratory experiments and the field trials were 80% concordant. Therefore, selected stress-tolerant accessions can now be directly sown over drought and saline lands, and some can be used as valuable gene sources in breeding programs. In addition to my PhD thesis, I have studied genetic similarity among 10 wheat species and subspecies using RAPD markers. Results of dendrogram showed that *T. dicoccoides arabicum* and *T. dicoccum farrum* were genetically very close, whereas species *T. monococcum* and *T. boeoticum*, with GS=O.30, were genotypically different and estimated as distant genotypes (data based on RAPD loci). There was no correlation among matrices based on agronomic characters and RAPD markers, suggesting that the 2 approaches are providing different estimates of genetic relationship among studied genotypes.

During 6 months I also worked on the project named "'Eco-geographic distribution of salinity tolerance in diploid wheats- at CSIRQ Plant Industry Institute and Australian Centre for Plant Functional Genomics (Australia) and completed it successfully. During this training, diploid wheat genotypes from various eco-geographic origins were phenotyped for exclusion of Na+ from leaf blades, and genotyped for two major genes for sodium exclusion, Nax1 and Nax2. The diploid genotypes included *Triticum monococcum*, subsp. monococcum and boeoticum, and *Triticum urartu*. Both genes for sodium exclusion, Nax1 and Nax2, were present in the majority of the *T. monococcums*, 101 of 109 accessions. The Naxl and Nax2 genes were not present in *T. urartu* with the exception of two out of 87 accessions tested. The lower leaf Na+ accumulation in T. *monocqccum* than in *T. urartu* accessions is probably due to the presence of the Nax1 and Nax2 genes.

However, some *T. urartu* accessions had low leaf Na+. indicating sodium exclusion is controlled by other genes in *T. urartu*. Absence of the Nax genes in *T. urartu* and modern wheat is consistent with *T. urartu* being the source of the modern A genome. This study identified new promising *T. monococcum* and *T.*

urartu accessions with very low leaf Na+ that may be useful as a new sources of sodium exclusion in breeding programs for improving the salinity tolerance of wheat.

The summary of those results were:
1. Most T. monococcum genotypes have the Naxl and Nax2 genes
2. The majority of T. urartu genotypes do not have Naxl and Nax2 genes
3.10 T. monococcum presence of the Naxl and Nax2 genes tends to correlate with lower leaf Na+, indicating that these genes are important for controlling sodium exclusion
4. Sodium exclusion is controlled by other genes in T. urartu
5. Absence of the Nax genes in T. urartu and modern wheat indicates that T. urartu is the source of the modern genome
6. Nax2 gene specific primers can be used to distinguish between T. monococcum and T. urartu species

I also completed project on '"Genetic Identification of Polyploid wheats using SSR markers~ at the Alexander Technological Educational Institution ofThessalonica in Greece in 2009 and learn new biotechnological and genetic methods. 40 papers on results of my research experiments were published, 20 of which were in foreign peer reviewed journals (Germany, Australia, USA, Turkey, Iran) and in conference materials (Australia, Austria, Italy, Japan, China, Korea, Iran, Tajikistan, Turkey).
In regards to my research background and my present position as a Wheat scientist into the [NAME REMOVED] Institute, I feel highly motivated in joining developed laboratory and getting involved in the proposed research topic focusing on characterization and use of wheat biodiversity on rust resistance gene. Wheat biodiversity conservation and characterization is a very important topic for my country, located in the ancient Persian area. Developing contacts with USA laboratories and improving my skills in agricultural biotechnology for study genetic bases of abiotic and biotic resistance is essential for my future research programs, back in Azerbaijan

2.ln order to provide food security in Azerbaijan the detailed characterization of plant genetic resources and selection of productive and resistant forms are inevitable. As it is known from the reports of ICARDA and FAO rust is widely spread in Azerbaijan and cause significant yield losses in wheat productivity. Resource-poor farmers who cannot afford pesticides are still at the mercy of such epidemics. The best control strategy for poor farmers in the developing world and the most environmentally friendly and profitable strategy for commercial farmers everywhere is to grow genetically resistant crop varieties. Unfortunately, actions toward the creation of new rust resistant forms in Azerbaijan only consist of phytopatological assessment and no any research has been carried out at molecular level. It is known that Azerbaijan is one of the origin countries for several cereal and legume plants and has rich plant genetic diversity and thus is expected to possess important genes of resistance to diseases, as well as to rust. Currently more than 10,000 plant accessions are conserved in national genebank more than 2,000 of which are wheat genotypes. Resistance of these accessions to rust in molecular level has not been studied yet. We do believe that research work carried out in USA within 12 weeks on resistance of wheat genotypes to rust disease will stimulate the experiments in this direction in our Republic.

Selection of resistant accessions within the studied collection and creation of core collection resistant to rust will help to prevent from this disease. These genotypes wilt serve as donors of resistance genes for creation of new varieties which in turn will lead to the sustainable development of Azerbaijan agriculture. So, on one hand serious losses from rust diseases will be averted and wheat productivity and income will be enhanced through the cultivation of genetically resistant wheat varieties, on the other hand negative impacts on environmental and human health because of use of agrochemicals (fungicides) will be reduced.

Research Action Plan

1st week - In this week I would like to listen my supervisor's presentation on rust resistance. Seeds of 100 bread and 100 durum wheat accessions obtained from Azerbaijan National Genebank will be grown in pots in greenhouse. All reagents will be prepared.

2-3rd weeks - Total genomic DNA will be extracted from individual genotypes of all accessions at seedling stage by CTAB method, DNA concentrations will be measured and will be diluted for further use. AU DNA material then will be screened for major leaf rust resistance genes using PCR-based molecular markers (SSR, STS).

4-5th weeks - Screening of accessions for major stem and stripe rust resistance genes.

6th week - All molecular data will be analyzed using computer programs and compared with each other. Accessions will be grouped and genotypes with resistance to each rust type, as well as with resistance to all three types will be selected. The outcomes of these activities will be the identification of wheat genotypes carrying the rust resistance genes for breeding cultivars with durable leaf, stem and stripe rust resistance.

7-8th weeks - Analyzing gene expression in resistant accessions using RT-PCR method.

9-1Oth weeks - Statistic analysis of all results.

11-12th week - To write a report and paper based on our results.

Fellow 2 (Male-Bulgaria)

1.Scientific background

I graduated Master course in the Department of Agricultural Economics at University of National and World Economics, Sofia and Doctor's course in the Kyushu University, Japan at the Department of Agricultural Economics . The Doctor Thesis is devoted to the "Study of sheep enterprise in Bulgaria". After my PhD Graduation in 2004,I came back to Bulgaria and since the mid of 2005,I have been working in the [a Bulgarian Institution-name removed for RFP] The [institution] is the leading national centre for research in the area of Agricultural, Rural, and Food Economics and Policies in Bulgaria.
Over these6 years period of work in the [institution],I have taken part in 7 national-commissioned , 7internationally contracted scientific projects and5 applied studies, each o them with minimum1 year duration. The total number of national and international published papers in peer-review journals and proceedings exceeds 30. Along with PhD course, I attended in 3 Fellowship programmes granted by UNESCO (lsrael), E U Marie Curie Programme (Poland) and Central European University (Hungary) dedicated to the sustainable development, Rural development and agrarian institutions. At the beginning of 2011,I am awarded as Associate Professor in the [institution].

2.Research Interests

As a researcher in the [institution], I belong to the Department of Agricultural and Rural Development Policy. This Department is predominantly in charge of studies and analysis connected directly to the adoption and implementation of the agricultural and rural development policies. As a member o f EU since 2007, Bulgaria transposed whole acquis communitaire in the agriculture and Common Agricultural Policy(CAP) .The CAP is based on two pillars, I pillar designated to agricultural and market support, while the ll Pillar covers Rural

Development Program.
As part of the above-mentioned Department, I am engaged in the researches and analyses devoted to the assessment of the impact from the implementation of direct payments to the Bulgarian farm structures and production sectors, to evaluation o f the outcomes from the implementation of measures listed in the Rural Development Programme. For last 1 year, I am involved in all research teams of [institution] for conduction of the analyses and assessment studies on implementation of the pre-accession agricultural and rural development program(SAPARD), the present Rural Development Programme, preparation of the Bulgarian report for Strategy 2020,elaboration of scenarios for allocation of direct payment between member states after 2 013,etc.
As regards the description hereinbefore, I can state that the main research interest is united to the study of Agricultural and rural policy and how this policy impacts the agricultural and rural sectors and what are the consequences for the actors. The proposed research topic in the Borlaug Fellowship Programme "Agricultural Market and Policy Analysis) fits thoroughly my affiliation and research interests.

3. Goal and objectives
The main goal o f the study fellowship will be to acquaint with the research, methodological tools and results achieved in the agricultural and market policy by the Economic Research Service(ERS) in USA and to transfer this knowledge to Bulgarian research practices. According to the main goal, the following objectives can be outlined:
. To review the main research and study analysis of ERS in the area of agricultural market and policy and to acquire perception for their structure and organization;
. To study the methodological and analysis approaches applied by the host research service and to master the relevant and state-of-the-arts research methods;

. To investigate the agricultural market forecasts elaborated by ERS, to oversee the expectations for food and commodity market development and t o have a sight on the policy recommendations;
. To understand the research actions connected to the global challenges for the agricultural and rural development in terms o f food-energy dilemma, climate changes, support of agriculture or public goods, etc.
4. Expected results and achievements
The main result from t he Borlaug Fellowship will be acquisition of the relevant methodology and state-of-the art knowledge possessed by ERS and their adaptation and implementation to the Bulgarian agricultural research. Along with the study of methodologies and research approaches, the fellowship will subserve for acquaintance with the visions and foresight analysis of ERS related to the agricultural and market policy.

As a member of EU, Bulgarian research bodies should provide insight to decision makers to support the national position in terms of priorities and accents in CAP, namely: farm support policy, rural development policy ,mitigation of climate changes, protection of biodiversity and environmental issues. ERS is a centre with immense experience and accrued knowledge in these fields and by the fellowship, this knowledge might be studied. lt will contribute to widen my perspective in the research and to deepen my expertise based on the knowledge and findings done by the ERS.

Another result from the fellowship will be the acquaintance with the model of work between ERS and USDA and other private and public decision-makers. The issues of research topics and themes elaborated by the ERS, conduction of the analysis and dissemination of results will be observed. lt will be interesting to learn where are the frontiers o f the researchers' participation, only to the positive analysis and studies or go beyond t o the normative recommendations and proposals.

5.Relevance of the study to Bulgarian agriculture
The program and project proposal address a key challenge for the Bulgarian agricultural research. This is the limitation and deficit to the some extent of the newest methodological instruments and approaches for investigation of the processes and impacts from the implementation of the agricultural policy and for study of the trends and make forecast estimation in the production and agricultural market.
The mastered knowledge in the ERS studies concerning the agricultural and market policy will be transferred to the Bulgarian researches, which will subserve for preparing deeper and more sophisticated analysis. Nowadays, the Bulgarian agricultural policy needs a profound scientific background to facilitate decision-making and to ensure national interest in the CAP. The fellowship will provide priceless experience and will give me the adequate confidence to continue my research work in service of Bulgarian agricultural policy.

Research Action Plan
1st Week
Acquaintance with the Economic Research Service.
The results from this objective is to understand the organizational structure of the work of ERS, what is the role
And what are the relationships of ERS with other organizations supporting the USDA. The organization of
Research and the allocation of researcher pose also interest.

2nd Week
Review of the main analysis and studies of ERS.
Main analysis and studies in relation with agricultural, market and rural policies will be reviewed and learnt. The topics of commodity markets, **farm production and support**, rural incomes, poverty and welfare, etc will be studied and main findings and conclusions will be mastered.

3rd - 4th weeks
Investigation of agricultural and commodity market forecasts and expectations.
The analysis and forecasts for the world wide trends in the agricultural and commodity markets done by ERS will be studied. Bulgaria is a small agricultural producer therefore should take into account the production situation and market development in big agricultural countries, as USA. The foresight analysis and trends in staple productions for Bulgarian agriculture as(grain, milk, meat, oil crops) will be observed and known.

5th - 6th weeks
Study of methodology and analytical tools.
The methodologies for assessment of the impacts from implementation of the agricultural policies, the effects from t he subsidies on the production and rural areas will be known. The knowledge o f new methodologies and analytical tools will fill up a great challenge for the Bulgarian agricultural research. The methodologies for ex-ante and e x-post assessment modeling of the policy impacts, implementation of the forecast analysis for the market and production will be studied.

7th week
Application of the selected methodological tools
Application of the studied methodological tools will be done to have practical exercise. A better knowing of the analytical tools and methods will be achieved. Theoretical study of the methodology will be followed by practical implementation closely demonstrated by host.

8th Week
A study trip
A study trip to public and private organizations around, direct stakeholders and executive policy bodies will be done. It will be interesting to have direct view and insight about the work of the commodity markets, to have conversation with farmers and agricultural associations, to have meetings in the USDA. The study trip will complement the knowledge and will bring significant practical advantage.

9-10th Weeks
Investigation of the research response to the global challenges
The researches and visions of the ERS concerning the global challenges in terms of food energy dilemma, climate changes, support of agriculture, public goods will be investigated. The new tendencies and orientation of research work in the context of global challenges will be observed and will be transferred to the Bulgarian agro-economic science. The proposals for changes in the agricultural policy done by ERS will be known.

11th Week
Discussion and scientific support on Bulgarian agricultural policy issues
A workshop with presentation of the main themes worked by me will be held. Some of the challenges met in research work will be discussed with researchers from ERS. Advises and recommendations for solution will be obtained. Parallel solving approaches given from t he experience of ERS researchers will be scrutinized.

l2th week
Overview report on the study fellowship and conversation for future collaboration
An overview report generalizing the studied and seen experience will be prepared. Conversation for the future collaboration between host institution and [home institution] will be conducted. lt will bring sustainability and continuity of the fellowship study and new opportunities for deepening of the research collaboration will be sought.

Fellow 3 (female-Bulgaria)

Program proposal

Species from genus *Helianthus* come from USA, but they are widely used in breeding programs worldwide. Research on sunflower focuses on studying genetic potential of wild species and establishment new sources of genes that determine the essential features of sunflower: resistance to biotical (*Plasmopara helianthi, Sclerotinia sclerotiorum, Phomopsis helianthi, Orobanche cumana*, etc.) and non-biotical stressors (drought, etc.), high oil level of the seeds, *Rf* genes for different CMS, etc. Hybridization of wild species with cultivated sunflower is often difficult to achieve because of the presence of many isolation barriers, and in order to overcome them, different biotechnology methods (in vitro methods) are used. Combining traditional breeding approaches with new biotechnological and molecular methods lead to faster resolution of problems such as incompatibility between species, creating hybrid plants and obtaining new cultivated sunflower.

My aim is to learn new methods, best management practices and correct approach to the different problems in the technology (molecular, cytological and breeding work) and seed production. I would like to visit USA and contact and work together with researchers on sunflower and other plants. I would like to observe the natural sunflower environment, the mapping and marker assisted selection and the crop production management. I would like to practice some new molecular and cytological methods. I would be glad to participate with my plant material – I can bring some sunflower germplasm from Bulgaria that could be introduced into my research program. I have obtained new source of CMS* (CMS HHIRZ-29 and in FAO with code CMS HIR 1) from the perennial species *H. hirsutus*, new forms suitable for R and B lines with high oil level of the seeds, resistance to one or more pathogenes or broomrape, with high pollen productivity during flowering, with a good seed productivity, appropriate size and weight of the seeds, *Rf* genes for different CMS PET-1. I have obtained the first ever hybrid** from *H. annuus* and *H. nuttallii* ssp. *rydbergii*.

I would like to be able to observe and participate in the practical use of new methods in order to include them in my future research work and the training of students.

Research Action Plan: Hosted by Sunflower lab

1. I would like to assist with planting yield trials with new GPS-guided planting equipment (June).
2. I would like to visit and take the course “Crop Breeding Techniques” of Dr. Marcelo Carena of the Department of Plant Sciences at North Dakota State University
3. I would like to learn doubled haploid development and work with protoplast culture.
4. I would like to visit and several days do genotyping work in the molecular laboratory in order to learn about efforts to identify DNA markers for genes of agronomic importance for the sunflower. If possible I will participate with my plant material - new lines with resistance to sclerotinia or broomrape, with high oil level of the seeds.
5. I would like to assist with nursery work and making testcrosses, etc. in the field, do agronomic and disease note.
6. I would like to meet with some research geneticists, agronomists, plant pathologists, botanists of sunflower and some who specialize in crops other than sunflower.
7. I would like to meet with breeders from seed companies.

   This is the exemplary plan of my program. The exact structure of study may be will determined in consultation with scientists. I would like to ask for a few trips, if budget allowed.

- Travel to seed production facilities.
- Travel to see high throughput genotyping.
- Travel to distant field sites.
- Travel to do the annual National Sunflower Association sunflower crop survey (September).

Fellow #4 (female-Bulgaria)

I am assistant professor at [NAME REMOVED] University, Bulgaria which has established traditions in education and research. In 2008, Central Scientific Research Laboratory (CSRL) was established as a research project funded by [NAME REMOVED] University and basic laboratory appliances were purchased. CSRL aims to incorporate in high-tech methods and analysis in the field of science and gradually grow into research and development center with a wide range of activities. The mission of that center is to conduct the scientific and applied research directed to improving quality of life by assessing the quality of different kind of food and its relevance to human health. The laboratory is not only educational and scientific potential of the University, but will contribute to the relationship between the university and public sector as a whole.

A polymerase chain reaction assay for detection of virulent genes - eae, stxl, stx2 of pathogenic *Escherichia coli* strains (EPEe, STEC) was developed successfully with my participation. That was possible due to the collaboration between specialists from the Faculty of Veterinary Medicine, Faculty of Medicine and Faculty of Agriculture. We will carry on developing new methods for detection of other food-born pathogens as *Listeria* spp., *Campylobacter* spp. etc. Thus we will be able to prevent consumer from food-born diseases by controlling the food in markets and detection of pathogens by molecular techniques.

I also consult microbiological examination of mastitis samples performed in Udder Health Laboratory situated in the Faculty of Veterinary Medicine which is a part of Extension Service in [NAME REMOVED] University established in the frame of the project America for Bulgaria Foundation.

Mastitis, the most important disease in dairy farming, represents clinical and subclinical infections that endanger health and welfare, accompanied by reduced milk production, increased cost of keeping the animals, increasing the number of cull, and in some cases cause death. Economic losses to farmers are considerable and great efforts to reduce the incidence of mastitis are made. However, the prevalence of subclinical and chronic mastitis is significant. Mastitis reduces milk yield and alters milk composition. The magnitude of reduced milk yield and alterations in milk composition is influenced by the severity of the inflammatory response, which in turn is influenced by the mastitis pathogen causing the infection. However, subclinical infections, the most common form of mastitis, are not readily apparent because there are no visible signs of the disease. Mastitis is a difficult disease to control because many different bacteria are capable of infecting the udder and producing the disease. Microorganisms that most frequently cause mastitis can be divided into two categories: contagious pathogens, which are spread from cow to cow primarily during the milking process, and environmental pathogens, which are found throughout the habitat of dairy cows. Current mastitis control programs are based on hygiene and include teat disinfection, antibiotic therapy and culling of chronically infected cows.

Acceptance and application of these measures has led to considerable progress in controlling mastitis caused by contagious mastitis pathogens such as *Streptococcus agalactiae* and *Staphylococcus aureus*. The prevalence of contagious mastitis pathogens was reduced, but the proportion of intramammary infections caused by environmental pathogens such as Escherichia coli and Streptococcus uberis has increased significantly.
Therefore, it is not surprising that mastitis caused by coliforms and environmental Streptococcus species has become a major problem in many well-managed dairy farms that have successfully controlled contagious pathogens.

Inflammation of the mammary gland is a reason for the widespread application of antibacterial therapy in lactating cows. On the other hand, the application of antibiotic treatment in these diseases result in illegal

residues of antibiotics in milk sold in the market. Antibiotic therapy of bacterial inflammation of the mammary gland in dairy cows has been identified as a catalyst for the development of resistance in bacteria isolated from treated animals, other animals from the herd and food of animal origin marketed for human consumption. Bacteria that cause animal diseases could transfer the resistance to other pathogens capable of causing human illness, thereby decreasing therapeutic effectiveness of antibiotics. Exposure of bacteria to antibiotics can result in selection of bacteria with broad antibiotic resistance patterns.

In conclusion, mastitis, milk quality and dairy food safety are all interrelated. Rapid diagnosis and treatment of affected cow and adequate measures to prevent incidence of mastitis among animals in the farm will increase the milk yield, improve the quality of milk and dairy products. My training in diagnosing of veterinary important pathogens, including mastitis pathogens and/or food-born pathogens and ability to cooperate and integrate knowledge in university center will be useful for farmers to solve the problems in the food chain: milk yield - milk quality - quality of dairy products - human health and to control the food for contamination with bacteria in Food Safety Laboratory at [NAME REMOVED] University.

Research Action Plan

1 st - 3rd week

Isolation and identification of bacteria from mastitis samples or other pathological conditions using conventional microbiological methods - culture media, stain procedures, biochemical reactions or identification systems (manual, semiautomatic or automatic), performing susceptibility tests to determine minimal inhibitory concentrations (MIC) of antimicrobial means to bacteria, determination of MICs 90.

4 th - 6 th week

Training in molecular procedures - polymerase chain reaction, isolation of DNA, determination of virulent genes in various samples. [Note: Applicant has basic background in PCR]

Fellow #5 (female-Bulgaria)

1. My scientific background involves more than 12 years working in various laboratories using mainly molecular, and biochemical techniques. Experimental work is molecular-based and involved techniques such as, DNA and RNA extractions, PCR, RT-PCR, RACE-PCR, inverse PCR, cDNA library construction and screening,
Northern blotting, Southern blotting, analysis of metabolism of various endogenous and exogenous compounds using TLC, HPLC, and GC-MS. Techniques that I am skilled and proficient. I have also experience in procedures involving analysis of metabolism of different compounds including fatty acids, hormones and pesticides. I have also studied plant transformation methods. I have always had input into the planning and design of my experiments which requires continual review. The time I have spent overseas has developed a strong independence in my work practice.

Current scientific interest involves altering the fatty acid composition of rapeseed oil and increasing its value as food and industrial material. In Bulgaria rapeseed is the second most important oil crop after the sunflower.
Except for household needs, rapeseed oil is also used as a source of energy and proved to be important for apiculture and improving the stainability of agriculture. The biological and chemical value of rapeseed consists in the high protein and essential fatty acids content. Seeds of different varieties contain about 40-45% oil, which provides for raw materials for production of vegetable oil for domestic needs and bio-diesel as well as methyl esters, for producing industrial lubricants and hydraulic oils, detergents, soaps and rapidly degradable plastics. After extraction of oil by cold pressing pellets contain 20-34% of high quality protein, which is used as livestock feed. Nutritional value of rapeseed oil is determined by the oil-acid composition and the biologically active substances it contains (vitamins - A, D, E and K), phosphatides, tocopherols. The composition of rapeseed oil includes mostly unsaturated fatty acids. Such high oleic content oil has a high resistance to oxidation, both in the process of nutrition, and in conditions of intense heating. My scientific interest involves altering the fatty acid composition of rapeseed oil and increasing its value as food and industrial raw material. Since the cultivation of rapeseed in the EU is conventional, the use of unmodified rapeseed is preferred in the food and fodder industry. The development of molecular markers and the widespread use of AFLP, ISSR and SSR, as well as gas chromatography and infrared spectrometry, enable the control and analysis of the quality and fat content of seeds. With the improvement of tools and methods in genetics and biotechnology, the question arises to produce new and useful fatty acids. The present research interests approaches for developing rapeseed genotypes with improved nutritional and energy value of the oil through the use molecular and biochemical techniques.

2. A number of challenges impede the conventional approaches to the modification of the rapeseed oil for changing its chemical profile. The choice of approach is defined by the desired change in the fatty acids and the most efficient method for creating the desired oil quality. An opportunity to work at you laboratory would allow me to expand my knowledge and research in exciting area of Biotechnology.

The application of the proposed integrative approach to solving problems will guarantee the success of the present project. Obtaining positive results from the present project will offer new solutions to pressing ecological, economical and social issues, the most important of which can be summarized as:
- reducing the emissions of greenhouse gases with long-term effects on the country ecology;
- development of alternative income resources in the underpriviledged regions, leading to a number of social effects - reduction of the migration to big cities, rising the standard of living in small communities, creating relative energy and economical independence of the small communities, etc.

Within the frame of the present project demonstration of the results is foreseen to industrial partners and local communities from the underpriviledged regions. This will provide for quick transfer of the technologies developed at a later stage.

Plant oils are in between the most valued goods in the international trade. They are subject to special high quality standards when used by food and feed industries and (more recently) as biofuels. Therefore during the last four decades much effort has been targeted at developing quality characteristics mainly related to the fatty acid content in rapeseed oil. These are aimed at satisfying the ever increasing needs ofthe industry.
The present project will provide new knowledge and results on modifying the quality of the rapeseed oil, its application in food and feed industries and as biofuel. Scientists from our country and abroad (USA) will be involved in the project. The results obtained during the studies will be targeted at the producers from different branches of the industry and at the consumers.

Research Action Plan

Description of work (6 weeks)—Note: May be modified in consultation with U.S. scientist

1. Screening of genotypes of oilseed rape expressing genes for types of cytochrome P450 involved in biosynthesis of fatty acids. Selection of suitable genotypes of oil-seed rape expressing genes and cytochrome P450 species that participate in lipid metabolism by hydrolyzing fatty acids. Screening of rape genotypes expressing genes involved in lipid metabolism and producing right cytochrome P450 species will be performed.

1.1.) Selection of genotypes suitable for the production of rapeseed oil with improved nutritional and / or energy value.
1.2.) Identification of best mutant genotypes for the production of oils with appropriate quality.
1.3.) Identification of the main characteristics of plants suitable for the production of oils with improved nutritional and / or energy value.

2. Analysis of the quantity and composition of fatty acids in rapeseed. The composition of fatty acids in rapeseed largely determines the physical and chemical properties of vegetable oil and its potential use for food or industrial needs. The most important characteristic of the quality of the oil is the ratio of oleic acid and stearic acid and the presence of essential fatty acids. Therefore, changes in rapeseed oil quality can be made by modifying the composition and concentration of the fatty acids. The goal of this task is by using GC-MS and NIRS analysis, which are rapid and inexpensive analytical approaches, to analyze the largest possible number of samples of seeds of different genotypes in order to select highly productive ones for subsequent experiments and detailed chemical analysis.

A number of challenges impede the conventional approaches to the modification of the Brassica napus oil for changing its chemical profile. The choice of approach is defined by the desired change in the fatty acids and the most efficient method for creating the desired oil quality. The conventional approaches that include induced mutations are constrained by the possibilities of interfering with the metabolic pathways, involved in the biosynthesis of the existing fatty acids within a species or genus. Up to now several oil types with modified oil quantity and composition are obtained from the representatives of the Brassica genus - some appropriate for human consumption, others - for industrial uses. These oils find their way in food industry, soap making, textile industry and machinery construction (for producing valuable lubricants). The studies on the genetic factors and their mapping allowed for manipulating these genes in a number of generations. All of this points to the possibility to achieve significant advances in the synthesis of unusual fatty acids in the oil of Brassica. Significant potential exists for producing fatty acids

that are not normally present in the seeds of oilseed rape. Successful implementation of the present project bears the potential for creating new rapeseed varieties whose oil can not only be devoid of the harmful erucic acid and glucosinoids but supplemented by the useful omega-3 fatty acids. This can lead in the long term to improving the dietary value of the rapeseed oil with all the resulting consequences for the health status of the population. These effects will have limited initial effect for our country due to the relatively small share of the rapeseed oil in the traditional Bulgarian cuisine. High consumption of rapeseed oil in the world and the strengthening tendency for consuming healthy foods indicate the availability of a stable and growing market for products with improved fatty acid composition based on rapeseed oil. Developing canola varieties carrying target characteristics for the present project will be of paramount importance at this stage when the market is in the transition stage from stressing on quantity to turning attention to more balanced and healthy nutrition.