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Postharvest Institute

Postharvest Institute for Perishables

NIS Potato Project

in

Russia and Ukraine

December 1993

College of Agriculture
University of Idaho

Postharvest Losses of Potatoes

in Russia and Ukriane

Trip Report

Bruise Reduction to Reduce Postharvest Losses of Potatoes

in Large Scale Operations

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ACKNOWLEDGMENTS

There were many individuals and organizations that were of great help in working on the problem of reducing bruise and other postharvest problems and losses in the Russian and Ukrainian potato industries. Because of the numbers involved, please refer to the Russian Contacts (page 24) and Ukrainian Contacts (page 29) at the end of the report and the comments. Without the cooperation and help of these organizations and individuals it would not have been possible to address the problems in their respective countries.

I. EXECUTIVE SUMMARY

It has been estimated by U.S., Russian and Ukrainian potato specialists that postharvest losses in the potato industries in these two countries can be as high as 30-80 percent in the former state controlled production and storage program. These losses are acknowledged to be much higher than occur with "backyard" producers or small individual farmers. This trip focused on making changes to machinery and operating management to reduce bruising to the potato crop in larger scale operations. It was interesting for this consultant to observe during this trip, a lack of understanding of what potato producers in the U.S. would consider the most elementary principles of bruise control.

Potatoes are a very fragile commodity. If they are not handled carefully and gently, they will be bruised. A bruise on a potato generally breaks the skin on the tuber and allows bacteria or fungi to penetrate below the skin of the potato and this disease begins to multiply. This shows up as a discolored or decayed area. Housewives have to peel much of the potato away to remove defects caused by bacteria which have entered the potato via a bruise location on the tuber. It is this problem that accounts for major postharvest losses in the large scale production and storage of potatoes in the NIS (New Independent States). Every step in the distribution process is subject to bruising potatoes. Reduction of bruising is also the area that can see the quickest and greatest results with the least amount of capital expenses.

This trip was a continuation of this consultant's previous trip which identified areas of focus that needed attention to reduce bruising in the Russia and Ukraine. Because the trip occurred just before harvest, many areas were not appropriate and timely for demonstrations as a result of the growing season of this year's potato crop.

The following areas were ignored because of time constraints: poor soil preparation for planting to eliminate clods at harvest, low quality seed potatoes, inadequate insect control during the growing season, and inadequate late blight control.

The appropriate areas addressed in an effort to help reduce postharvest food losses were: increasing the farmers understanding of how potatoes bruise; demonstrate simple, but significant design changes in potato equipment for harvest, hauling, piling, and storage of potatoes; increased understanding on how to run and operate potato harvesters, pilers, and other equipment to reduce bruise; increasing the awareness and understanding of tuber handling temperatures and how to use tuber temperature to reduce bruise; education of farm managers on how to increase humidity in storage; how to improve their storage management, and how to improve destorage (or potato removal) management.

II. INTRODUCTION

This trip was intended to correct some of the sources of postharvest losses in potatc crops at the AID financed potato storage sites, at "Farm Russia" and at the Ukrainiar Institute for Potato Research. The reduction of bruising demonstration was approached by locating the best foam cushioning material that was made in the U.S. and to purchase and ship some of this material to Russia for application there. All the necessary tools were obtained to make appropriate structural changes and modifications to Russian and Ukrainian potato harvesters. Relevant video material and literature were delivered to these countries from the U.S.

Because there is a pattern of problems that are consistent throughout the NIS as a result of the central planning of the former Soviet Government, problems identified and corrected in one location might apply to other areas in the former Soviet Union. Therefore, this concept of focus can be appropriate to dealing with other problems in agriculture in NIS countries.

Because bruising of potatoes is not generally understood in NIS by potato specialists, education is very important. With farmers, a show-and-tell program is very helpful if not necessary. Also, if bruise can be identified on-site at the time it actually happens with the individuals that are handling potatoes, accountability will be established and postharvest losses in the potato industry in large scale production can be reduced dramatically.

II. BACKGROUND INFORMATION

The former Soviet Union has been in an unstable food production situation for many years. A major food problem surfaced world-wide in the middle 1970's when the European drought required them to import large quantities of grain from many countries including large scale grain exports from the U.S. to the then Soviet Union. The problems continued to surface over the years until the leaders of the Soviet Union were admitting in essence that the system didn't work very well.

IV. METHODOLOGY

This consultant located the best state-of-the-art material possible to take to Russia and Ukraine in terms of foam rubber padding for demonstrations on potato harvesting machinery in these countries. The two target locations were identified as the AID supported storage sites in Russia and Ukraine. This consultant has had extensive hands on experience in modifying and designing potato machinery. Parts and tools were taken to the NIS in order

to be equipped to expediently make the necessary changes. Included in the equipment were chemicals and equipment for rapid identification of bruised potatoes. Also, video films produced by the University of Idaho in PAL/SECAM and literature on bruising were taken along with the equipment.

V. RESULTS AND DISCUSSION

The major source of postharvest losses in large scale production of potatoes in the NIS is a result of bruises during the various handling operations from harvesting to consumption. The main source of initial information concerning Russia was supplied by Concern Roscar or Russian Potato Concern which is headquartered in Moscow. This collaborative organization has contacts over large areas of the NIS. It was interesting to quiz state specialists to observe the emphasis on technology and equipment. They have strong feelings that the problem is poor equipment. They felt that if they could obtain "good" American equipment, that this would solve most of their problems. In evaluating the situation on a previous trip, this consultant saw many potatoes being sold in the private markets sector that were without bruise or other disease problems. It was difficult to understand why there were such large reported losses in large scale production when other potatoes produced by smaller farmers were of such good quality. Investigations showed that most of the smaller private sector farms dig their potatoes by hand, while most of the larger collective farms used Russian or East German built combines. Unless all conditions and operations are perfect, even these bruise potatoes considerably under perfect conditions. The current design may not allow for operation in a bruise free method. The big difference then between the quality of large farms and small producers is the use of improperly run mechanical labor saving devices which add to the harvest losses.

Ironically, the situation in Russia may be similar to the history of the potato industry in Idaho. In the late 1950s, mechanical potato harvesters were first introduced to the Idaho potato industry. There were many problems with bruising, using the new mechanical harvesters, in comparison with hand-harvested potatoes. Many growers said that they were never going to use these "new fangled bruise machines". In many ways their initial objections were correct. There was more bruise with the newly developed machines than in the hand-harvesting method. It took several years and many improvements for mechanical harvesters to approach the low bruise levels of hand harvesting. There were dozens of different designs and each year there was another model that was introduced that was better than the last one. The driving force behind the shift in Idaho and the rest of the U.S. was the rising cost of labor and the difficulties of actually obtaining labor to do the necessary hand work. (This consultant was the last generation of Idaho school children who worked in hand-harvesting of potatoes during a two week "harvest school vacation" in the fall each year.)

In the NIS, there is only one manufacturer of potato harvesters in the country. This factory is at Riazon. The fact that there is only one plant is typical of the central control in the Soviet Union. This potato harvester is not user friendly. It is not efficient in terms of acres harvested per day. It is not efficient in terms of soil elimination. It is built like a tank, but tanks don't make good potato harvesters! These machines bruise potatoes the same as U.S. harvesters when operated without bruise control methods (perhaps more so).

The emerging private farmer who has enough hectares to be an economical unit will grow more potatoes than he can harvest by hand. The small individual farmer of 3-5 hectares who reportedly produces a large proportion of marketed potatoes in Russia also needs some mechanical help in harvesting potatoes. Therefore, the bruise problem resulting from mechanical harvesting in the NIS will be a problem for any private farmer who has enlarged his operation to achieve efficiencies of scale. If farmers move from low bruise hand harvesting to mechanical harvesting without adequate understanding of bruise problems, they could incur losses the first year they use mechanical harvesters.

In discussing equipment changes with the management of Farm Russia and the Ukrainian Institute of Potato Research, this consultant was surprised to hear questions as, "Why do you keep talking about potatoes hitting potatoes as such a big deal?" They did not have complete understanding that potatoes-on-potatoes eliminates most bruising. It was important to stress the basics of bruise control until there was a realization of the seriousness of the problem and the possible solutions.

It was important to identify the points at which bruise takes place in order to be able to improve the situation, but because of the lack of understanding, this consultant felt it was necessary to concentrate on the basics. The problem areas that were discussed are given below.

Tractor tires:

In looking at tractors used for pulling potato harvesters, it was obvious that there was a problem with the narrow potato rows and the wide tires on some of the tractors. The large tires bruise potatoes in the soil before the harvester can even dig them. Another problem is the actual width adjustment of the tires on the tractor axle. Tractors are shipped with a standard tire setting on the adjustable axle. The tires should be set to run in the center of the furrow which will protect the tubers as much as possible from the tire treads. Both the front and the rear axles need to be adjusted. If narrow tires are not available in the NIS, the rows need to be widened at planting time.

In initiating the discussion on making changes on the farm, it was interesting to observe that potato specialists did not admit that there was any problem. This consultant spent a day going from tractor to tractor and harvest trailer to harvest trailer with a measuring tape and showing the farm manager how the tires were not

going to be in the furrow at harvest time. He began to see that there really was a problem.

None of the tractor tires had correct spacing. None of the tires had been adjusted after being shipped from the factory. We could see the original paint on the axles. The width of the tires measured 147 cm to 157 cm. With the rows having a spacing of 70 cm each, the tractor tires should have been 140 cm. The farm manager surprised this consultant by saying it was impossible to adjust the tires. Permission was requested to let this consultant "play around" with one tractor and they agreed.

The next day we had a blue 4-wheel drive MTZ, model 80 (80Hp) with 15.5 x 38 rubber to "play with". This tractor is made in Belarus. It had a Fiat front end that was impressive. The rest of the tractor was simple and plain, but adequate.

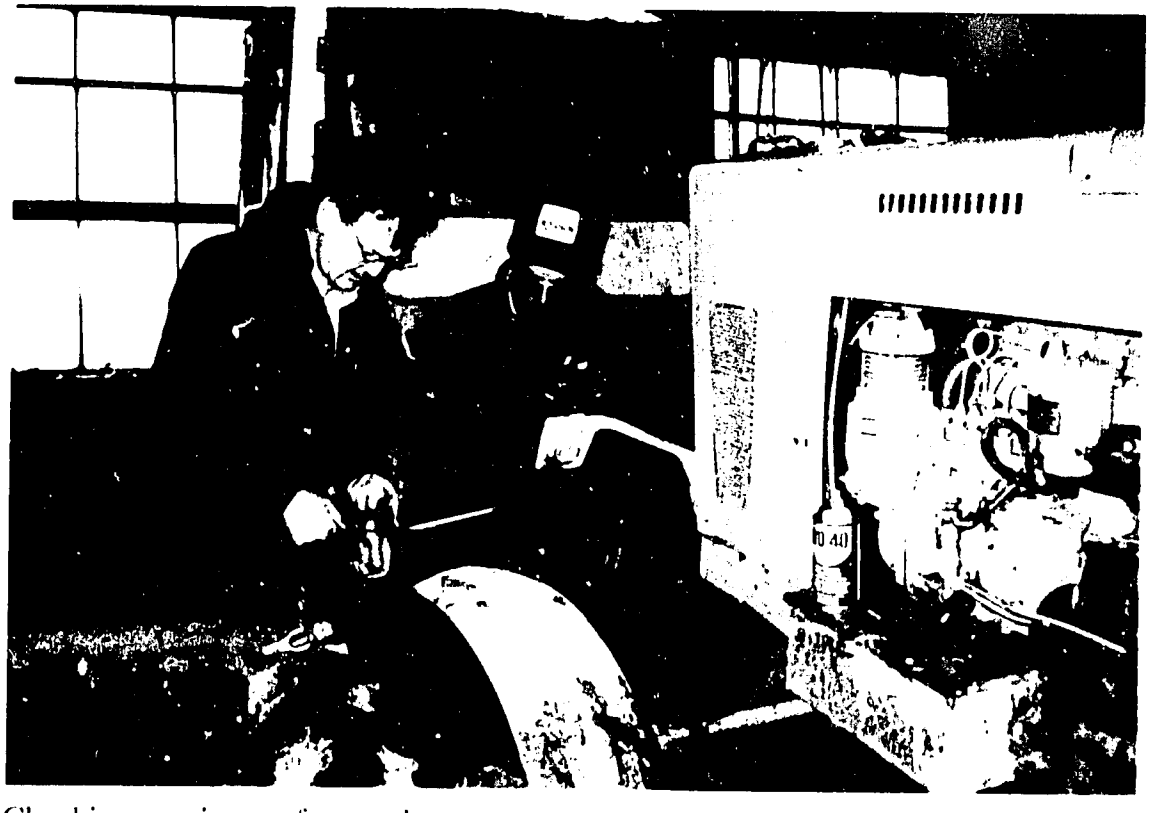
On the front end we used 24 mm, 30 mm and 12 mm wrenches. The 24 and 30 mm sizes must be open end wrenches. For working on the inside rim of the front wheels, we used a 24 mm socket. The 12 mm wrench can be a socket. The 27 mm wrench was used on the lug nuts. A 12" or 18 " extension and breaker bar should be best for this operation because the nuts can be frozen in place from the tires lack of ever being adjusted.

On the rear wheels, we needed a 32 mm socket and 32 mm end wrench. Unfortunately this was the only size I did not bring with me from the USA. Fortunately, they had a wrench that would work. This one should be a heavy duty socket.

For the dust cover on the wheel adjustment, we needed a 10 mm socket to remove the dust cover. A reminder: ratchets for sockets are scarce. To move the wheels we took off one wheel to get to the axle adjustments under the fenders of the big rear tires.

See enclosed pictures of the tire changing operation in preparing a tractor to straddle three rows that would pull a trailer that straddles three rows.

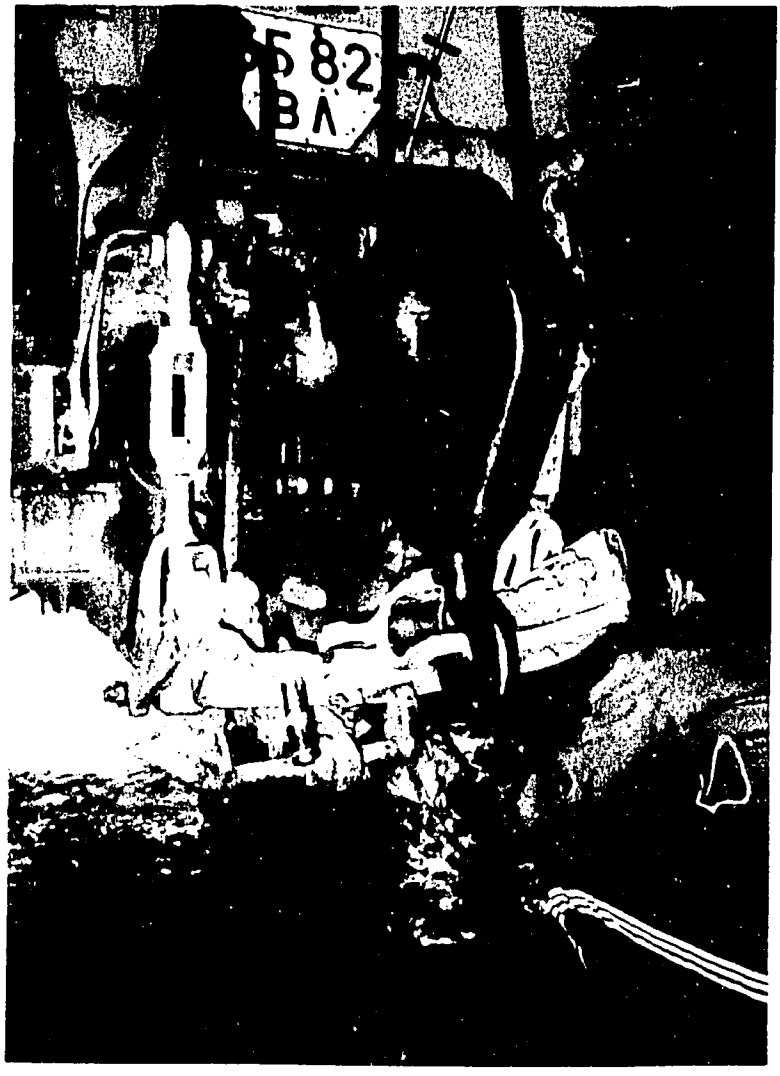
1. Adjusting front axle spacing after removal of dust cover on left side of tractor's front axle.



2. Checking spacing on front axle.

3. Checking final spacing on front axle.

4. Pointing out the simple method of raising and blocking tractor when adjusting rear wheels.

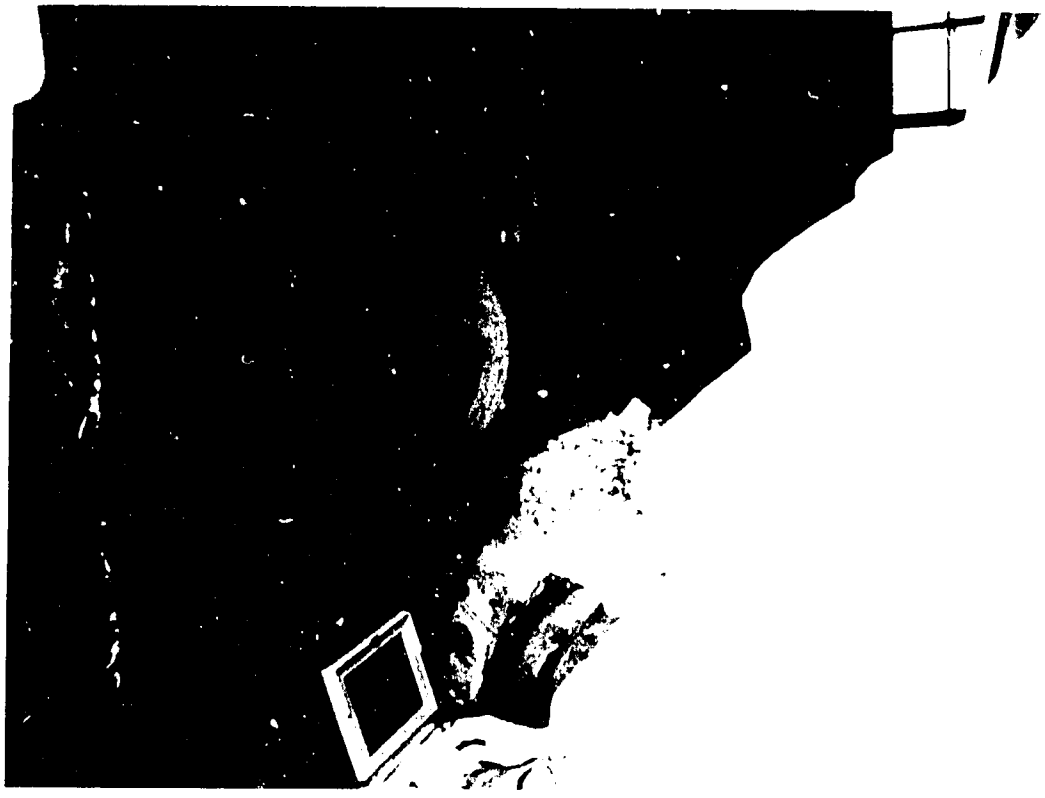


5. Blocking tractor after it has been lifted.

6. Pointing out how much rear tires needed to be moved.

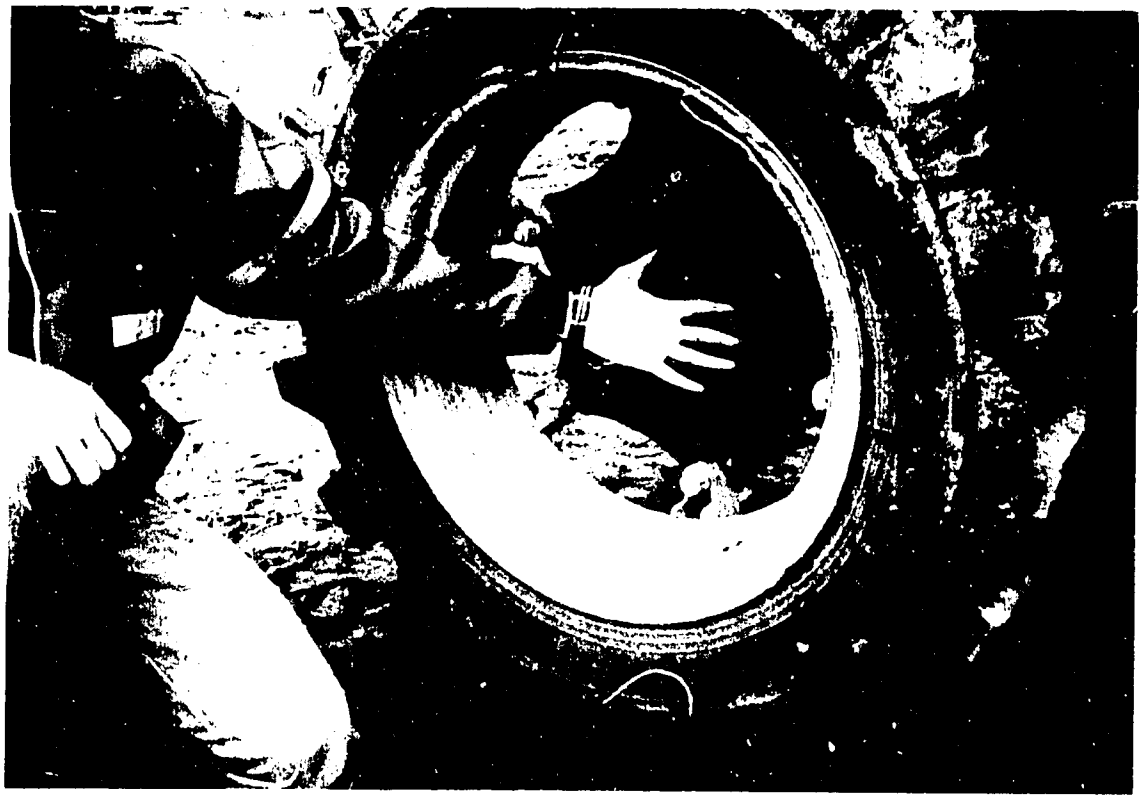
7. Farm manager (rt) and mechanic point out adjustment screw that they did not know existed before this exercise.

8. Tractor drivers switching tires from one side to another to get the proper spacing for straddling three rows.



9. Will Anderson entering data on his Macintosh Powerbook in the "Farm Russia" shop.

10. Inside close-up shot of front tire after adjustment.



11. Outside close-up view of front tire after adjustment.

12. Final results of adjusting tractor to wide stance for opening potato fields at harvest without bruising when they are working with 70 cm rows.

This consultant was observed entering the data concerning the tire adjustment on a Macintosh Powerbook laptop computer. The farm manager had never seen a laptop computer. He typed his name onto the screen. This was the first time he had typed on a computer. He was shown how to operate a Macintosh with some beginning techniques and he caught on quickly. He was then shown a spreadsheet and how to build one for farm budgeting. He was excited about the use of this tool in planning. This has interesting possibilities for future training in moving toward the free market with larger scale farms.

Trailers used for hauling potatoes to storages at harvest time varied on wheel spacing from 180 cm to 182 cm. This put the tires directly on top of the potatoes when they began to open a field with a combine.

Farm mechanics said we could not adjust the trailer tires. This consultant convinced the farm manager to try it with one old trailer. It was demonstrated that all he had to do was cut out 40 cm and it would be perfect in terms of straddling two rows. He did not want to go narrower with the trailer to span two rows because of stability problems. He was shown how he could cut the axle and put a simple 30 cm extension into the axle. We found two old axles in the junk yard and had them delivered to an area with a cutting torch. The axle pieces were cut and we came up with a simple trailer that would span three rows. The wheel bearings were tightened and the operation was finished.

Tractor traction:

It was mentioned that tractors do not have the necessary traction to pull potato combines in the fields. Often they have to raise the digger blades to avoid getting stuck. Adding liquid to the tires would almost double their pulling power. The Postharvest Institute was contacted through E-Mail and details were sent for filling tractor tires with liquid. It is a simple process and they understood it immediately.

Planting depth of seed potatoes:

It is important to plant at least four inches below the ground level in order to protect the tubers from sunlight and frost. We discussed this potential problem area.

Digger blades:

Digger blades determine how much dirt is going to be delivered to the chains of the harvester. These blades need to be adjusted to slide the potatoes on top of the chain and not into the chains. The digger blades needed a little adjustment, but were not too far off.

Volume of soil carried by the harvester:

The volume of soil being carried by the harvester is very important for cushioning the potatoes at each drop. It is ideal to carry soil as far as possible and still not put any in the truck carrying the potatoes. The volume of potatoes being carried on the harvester chains also influences the required amount of soil. This area was discussed, but this consultant was not there during the actual harvest.

Rubber padding:

Every right angle needs rubber padding against the steel plates where potatoes can hit and bruise. Rubber padding was left at Farm Russia with the glue to apply the material. This consultant was not able to put this on the machinery because of time constraints.

In Kiev at the Ukrainian Institute for Potato Research, this consultant supervised the application of polyurethane foam on a potato piler hopper and to a test patch on the concrete wall of a potato storage. This was the first known application of Urethane foam to potato machinery in the NIS. It may have been the first material to be used to reduce bruise on machinery in the NIS. It went on very nicely and will be a good test this year.

Potato drops on hoppers:

Every drop needs to be full of potatoes or dirt to neutralize distance and impact against hard surfaces. These drops need to be reduced as much as possible. This is a major problem at the AID supported storage sites in Ukraine and Russia. Each tuber has over thirty feet of drops to get to the potato pile in the storage building.

We spent considerable time working with the East German made combines that they had acknowledged as their best machines. We were able to figure out how to modify the boom with a simple change that would lower the drop from ten feet to 6 inches when the potatoes were delivered into trailers.

We discussed this area in detail because it involves operator control at each step of the handling process. It is thought there was some good progress in this area.

Slope of receiving surface:

The receiving surface should be sloped, if possible, so that potatoes slow down in a rolling manner, rather than an abrupt stop. This reduces the spot impact on potatoes. This was a detail that we did not cover because of the more serious areas.

Flighted conveyors:

Conveyors or chains that have flights or steps on them to carry tubers up inclines have a tendency to "flip" or "throw" tubers at the end of the incline. We found that by leveling out the incline at the top or kinking the end so that the conveyor is actually letting the potatoes fall away from the flights results in less bruise. All the farms visited using mechanical equipment, and the base storage units have this problem. This was not covered on this trip because of other priority areas.

Soft-belt principle:

All drops on to a belt conveyor should have the metal support cut out from underneath the rubber belt at the point of impact. This gives a cushioned stop instead of an abrupt stop for the tubers. This was a major problem at the AID supported storage sites in Ukraine and in Russia.

We discussed this point but did not have time to make any changes.

Chain speed:

Every chain needs to be adjusted in terms of other chains to keep them full of dirt and potatoes at normal digging speed. We discussed this area in detail. We measured the speed of the primary, secondary chains and elevator in terms of miles per hour. The secondary chain was going the same speed as the primary which is a big problem. The secondary should be going slower than the primary. The "up and in" boom was going about 70 percent as fast as the primary. This was much too fast for the yields and ground speed that they were traveling.

Ground speed:

The ground speed should always be faster than the km/hr speed of the primary chain (the first chain in the harvester).

We discussed this area in detail. Potato people in Russia say they travel about two miles per hour. This was based on what they demonstrated by walking. This figure was later confirmed while walking next to other combines.

Revolutions per minute (RPM) of the tractor:

If the harvester is PTO (power take off) driven by the tractor, the RPM's need to be constantly adjusted as a function of changing soil, field, weather and tuber conditions.

Tractors are operated at 1600 to 1800 RPM's when harvesting. This is too fast for the ground speed that they are traveling.

Loading of trucks:

Combines should never stop while harvesting except to turn around or change trucks. The standard practice in the NIS is to load the harvester and then stop. Pull the truck under the harvester and unload the machine. Stop and go. Stop and go. Stop and go. This gives empty drops all through the harvester every time it unloads and starts again.

We discussed this in detail.

Unloading of trucks:

The NIS use dump trucks to harvest potatoes. This can be a good method if managed correctly. The big danger is the initial drop on to the Russian pilers. They need to stop the pilers when the truck is unloaded so that all the drops on the piler remain full. In some situations that were visited, the potatoes were treated like coal. Dump trucks unload potatoes in the storage building and a front end loader then scoops up the potatoes and dumps them into the pile of stored potatoes.

They do what ever is needed to get the potatoes out of the ground and into trucks. Then they take the potatoes to a flat area and dump them in piles and cover them with straw. They immediately begin to sort the potatoes by hand into the following categories: eating, seed, and livestock food. The eating potatoes go to market, seeds go into storage and the livestock feed goes to pigs. This method was used in both Farm Russia and Kiev.

Pilers in storage:

All drops of potatoes need to have rubber padding placed on metal striking surfaces to make the impact softer when potatoes land on hard surfaces. We foamed one hopper of a piler as mentioned earlier.

Tuber temperature:

Potato bruise is inversely related to temperature. The higher the pulp temperature of potatoes, the lower the bruise danger. The general temperature in Russia seems to be acceptable at harvest time. This could account for the fact that not all potatoes are bruised, only a large percentage. But, when the potatoes are taken out of storage, the pulp temperature needs to be taken into consideration. If they try to handle the potatoes with mechanical equipment when the pulp temperatures are low which is necessary for good long term storage, they will end up

with bruised potatoes delivered to consumers. We talked about this problem, but generally, the harvest is not done when the temperatures are below 45 degrees F. This in combination with the fact that tubers are very small works to keep the bruise down to a still unacceptable level but not a total disaster.

Humidity:

The standard for good storage is 90 percent plus relative humidity. The consultant did not see any humidifiers in any of the storages visited anywhere in the NIS. It was confirmed with Roscar that humidity was not added to storage in the NIS. Proper humidity is necessary for bruise healing at harvest time. Without appropriate humidity, the process of suberation (healing of nicks and cuts and bruises) on potatoes does not take place without decay producing bacteria and fungi attacking the potatoes.

It was apparent that current storages would not support humidity over 85 percent without it beginning to "rain". The concrete structures are just not insulated sufficiently to allow high humidity. Therefore, this aspect was put in the background for the time being.

Sorting equipment:

All the big farms that were visited had large sorting equipment sites. Workers were trying to sort and grade at harvest time. The potatoes are most vulnerable at this time. The equipment that is used for sorting at harvest time is not designed to reduce bruising of potatoes. Most of the equipment causes potatoes to drop up to 10 feet. The total of all the drops that potatoes experience is over 25 feet before they are delivered to the storage building.

We discussed this problem area and everyone wanted to discard this equipment. They weren't knowledgeable of how to get the job done without it. Their biggest motivation was maintainence and keeping it running. They didn't have spare parts and the know-how to keep it operating.

Time of sorting:

Sorting should take place at least 30 days after the end of harvest. The apparent reason that sorting takes place at harvest is to deliver potatoes to the state controlled base storage units on time. With this program, central government planners could control the supply of food to insure enough food for the state stores. Bruise was not a concern of the central planners. In fairness to current and past distribution systems, if the weather gets too cold for transport, central base storages would act as a cushion in cities like Moscow so that they would not run out of food. In Idaho there are times when the weather shuts down all shipments of potatoes due

to the cold temperatures or snowfall. In the U.S. as a whole, the efficient transportation infrastructure allows other areas that are not experiencing severe weather to fill in the gaps that Idaho can't fill. In the NIS, the transportation infrastructure and marketing structure is not as flexible. With this in mind, we who are advising in the NIS need to be cautious in our advice so that we don't encourage changes in the food supply situation without considering all the ramifications.

With privatization, the current delivery schedule is a thing of the past. The free market is taking over!

VI. CULTURAL PRACTICES AND MANAGEMENT

Every aspect of each handling operation of potatoes requires diligence in attention to details if damage to the potatoes is to be kept to a minimum. The common denominator is that there is not a complete understanding of "cause and effect" in the area of bruising potatoes in Russia and Ukraine. It was apparent in conversations with both Russian and Ukrainian farmers and potato specialists that they did not understand the cause of bruising, and they were not even aware that this was an indirect problem that resulted in much of the storage losses.

When we talked about padding on steel surfaces and keeping hoppers and drops full of potatoes to reduce drop distances, it often appeared that they did not understand what was being presented to them. This situation was consistent throughout the NIS.

If the management practices in the NIS were used in Idaho with Idaho potatoes, we would have a very high percentage of bruise in our potatoes also.

We discussed this problem area in detail. These discussions took place with Farm Russia, Dimitrov Farmers Association President and Manager, AKKOR one row harvester manufacturer, Ukrainian Institute for Potato Research as well as other farmers.

VII. HANDLING TEMPERATURE

A fact that became apparent in discussions throughout the NIS was that the elevations of potato areas are less than 1000 feet above sea level. The elevations and the consistent day and night temperatures result in a warmer pulp temperature during much of the harvest period than what is experienced in much of the potato areas of North America. This little recognized fact results in much less bruise in the NIS than what would have been experienced in Idaho under similar management and equipment.

In Idaho potato growing areas are at an elevation of 4000-5000 feet above sea level. At these altitudes, we often experience pulp temperatures that are 1-5 degree Celsius. In the NIS, the estimated temperatures at harvest time are generally in the 10-15 degree Celsius range. Because bruising is inversely related to temperature where as bruising goes down as temperature goes up, the NIS ignored bruising for years because they hand harvested all their potatoes. When harvest machinery was introduced to the NIS, the automatic checks and controls of a free market were not in place to lead to reduced bruise in the potato industry.

The interesting point is that there is not even more bruising than what actually occurs. A significant factor here is that the tubers are generally small in size due to various reasons. But, this small size helps reduce bruising. For the farmers to grow bigger potatoes for french fries, they will have to eliminate this major problem in order to make a profit.

VII. EQUIPMENT DESIGN AND MODIFICATIONS

Because there was not an opportunity for competition to develop in the area of machinery production under the Soviet Union's central planning system, no firm has had the chance to initiate increased equipment manufacturing which would lead to competition and improved equipment design.

There was a positive response to bruise discussion from most groups. The response generally was in the form of a question, "Can you come or can you send someone to teach us how to modify our equipment and operate it so we will not bruise our potatoes?"

This consultant met with the people heading up the development of a one-row harvester. They are associated with AKKOR and have built five of these machines for testing this year. They plan to build 5000 of them for sale in Russia. They were shown the bruise films, catechol tests and the foam rubber. Their names are Alexander Poryadoshny and Anatoly Larvrohen.

I put an action plan on paper and translated it into Russian for Farm Russia. (The English version was typed as seen below, then the interpreter translated the plan into Russian using a Russian font program. A Russian hard copy was generated on the portable Macintosh printer on-site at Farm Russia. When we passed out the Russian version, the response was very positive). The plan is given on the following page.

PLAN FOR CHANGING RUSSIAN POTATO EQUIPMENT
AUGUST 1993
WILL ANDERSON WITH POSTHARVEST INSTITUTE

1. Tractor wheels on combine tractor: Adjust all tractor wheels as close as possible to 140 cm in width on the front and back tractor wheels for tractors pulling potato harvesters.

2. Tractor wheels on tractors that work with harvesting combines that opens up fields: Adjust wheels to 210 cm on front and back (three row diggers).

3. Modify two trailers to match rows so tires run between furrows. Extend axles to put tires on 210 cm centers. This will require lengthening the present axle by welding a section of axle of about 30 cm in length in the middle of the current axle. This will not extend the wheel outside of the trailer box .

4. Fix pilers:
   - measure speed of piler belts
   - hopper: put foam rubber on steel where potatoes will hit metal
   - hopper: rubber finger flap over rubber conveyor belt to hold potatoes so potatoes fall on potatoes when unloading trucks
   - stands on pilers: install flat plate of steel for workers to stand to pick bad potatoes off of the piler incline
   - hopper: modify boom hopper for limited bruise with foam rubber and finger flap on top of piler
   - determine how to eliminate dirt before potato pile

5. German combine
   - measure speed of chains on combine
   - adjust boom to lower drop into trailers and trucks

6. Riazan Combine
   - measure speed of combine chains
   - raise secondary and deviner front rollers to reduce drop from primary chain.
   - secondary chain: lower secondary so that drop on to rubber buckets is smaller
   - deviner chain: install rubber ropes between deviners
   - boom: adjust boom to lower drop into truck beds
   - boom: put slide on hopper down to boom steel chain or other ideas to lower this drop for potatoes

The needed modifications apply to every area of operation from planting, seed handling, harvesting, piling, and storage. This consultant was able to make significant steps in understanding what changes and how they need to be made. Time constraints were a factor in not finishing the task.

IX. INSECT CONTROL

There was very little emphasis or discussion on insect control. This whole area in the NIS needs to be developed and understood by both the NIS and the U.S. specialists. The first step would be to identify the extent and severity of the problems.

In meetings we did have extensive discussions on Colorado Potato Beetle because this insect's damage is so obvious and the insects are large and can be seen easily. In terms of virus vectors such as the Green Peach Aphid (Mysus persica), it seemed to be somewhat of an unknown as to the extent of the damage that these viruses cause to the potato industry in the NIS. Other insect problems may exist but because the aphids are very difficult to see by the untrained eye, they are not recognized. Insect socks or nets for collecting insects seemed to be unkown to many people in the potato industry. Thrip, one of the most destructive insects to potatoes, was not understood by potato specialists either.

Several fields were checked for thrips and there were the typical thrips that do serious damage to potato fields in the U.S. It was suspected that this is a major problem in the NIS but they haven't recognized the seriousness of it.

X. SEED POTATO QUALITY

The need for vector control in potato production directly relates to the quality of seed potatoes that are available. It was reported that 90 percent plus of the seed potato stock in the NIS is infected by viruses. A large percentage of all the potatoes are grown without using certified seed. Those potatoes that are classified as certified seed are generally also infected with viruses. It appears that there has not been accountability for keeping the seed sources virus-free. This could account for a yield reduction of 20-75 percent.

It appears of great importance that AID has made potato storage construction in Russia and Ukraine a priority in that one of the first AID funded projects for agriculture that will be completed in Russia and Ukraine are seed potato storages.

Because of various production problems, the supply of seed potatoes will be short in Russia this year.

In the past, the Russian government has put all its monies being spent in agriculture into collective and state farms and the private growers were almost completely neglected. The interesting fact is that the collective farms produce about an estimated 15 percent of potatoes in Russia, whereas small individual producers and backyard "dacha" growers produce about 85 percent. The Russian Ministry of Agriculture has made a dramatic shift

in its priorities to address this situation. Recently, it has shifted its policy to focus more on small individual producers which is unique to the NIS. This may have a dramatic impact on the future privatization of the potato industry and production of eating potatoes. It is important to note that seed production for small individual growers will be a major focus of the Russian Ministry of Agriculture.

XI. FUNGI CONTROL

The irrigated desert areas of the northwestern part of the United States only have late blight in a few areas that have wet (or irrigated), cool weather. Early blight is much more of a problem in the growing areas in this region of the U.S. Late blight in the NIS is responsible for reduced vine growth during the summer growth period, but the biggest danger is storage losses from this disease. (Remember, it was late blight that was responsible for the Irish potato famine during the 1800s.)

The 1993 growing season has been one of the worst years in Russian history for late blight. Individual producers who do not have any chemical protection were seriously hurt. Most of the individual producers and backyard gardens have been wiped out in terms of being able to use their own seed for next year like they generally do. Many home gardens were observed that were completely dead from late blight.

In the fields at Farm Russia, tubers were examined and pointed out as being infected with late blight. They said that this was the earliest they had ever seen late blight on tubers. Late blight on tubers at Krasnov's farm were discovered when tuber samples were taken to estimate yield. (Yield is very important in determining appropriate ground speed for the potato harvester in order to keep bruise at a minimum.)

It was pointed out to both the director of Farm Russia and the director of Ukrainian Institute for Potato Research that there has been successful work done with adding ozone and hydrogen peroxide to the air system for fungi control. It was suggested that they check out literature in terms of late blight control in storage this year.

A detailed study during the destorage process would help give a perspective of the storage losses incurred as a result of this fungi.

XII. TRANSPORTATION

The most widely used method of transportation is a small dump truck. This is a low sided, steel, flat bottomed vehicle. In terms of initial bruising, this vehicle is not a problem. The loading of the vehicle is where bruise could occur if the drop off the boom of the

harvester is not kept to a minimum. After loading of the truck, potatoes are transported to the storage buildings. At this point, there is a large drop out of the back of the truck onto the ground or into a piler's hopper. This drop is often 3-5 feet in distance. The tubers that hit the bottom first will most likely be 100 percent bruised.

This consultant met with the director of "Farm Russia" to discuss the construction of an unloading station by using some old conveyors that were in the junk pile. It would not take much effort to modify them to have a series of conveyors running the potatoes into the storages from an outside unloading station. A typical station was diagrammed which would handle two to three trucks at a time and reduce bruising at the same time.

It is important to remember that the problem is accumulative in terms of the number of bruises on individual potatoes and in terms of the numbers of individual tubers that have bruises. Every time the potato experiences a drop, from the primary chain (the first chain) on the harvester to the delivery of potatoes to the consumer, the potato is at risk of being bruised.

XIII. RECOMMENDATIONS

It is recommended that further demonstrations be organized in Russia and Ukraine to modify local harvesting machinery and potato handling equipment. Parts and supplies brought from the U.S. should be used initially. (U.S. parts would allow rapid changes, rather than searching the NIS for the needed small items.) The modifications would focus on bruise reduction changes. Most of the changes would involve structural changes to specific areas mentioned in this report, addition of padding and in person-controlled changes in harvest machinery operations.

It would be beneficial to take pictures of the changes for broad distribution in the NIS. It would also be beneficial to involve as many of the local farm mechanics and farmers in the modifications so that they could take the changes back to their farms. A working arrangement with the only combine manufacturer in Russia to facilitate changes at the factory would also be very helpful.

The presentation of the Postharvest Bruise Prevention videos would be of great help in presenting the general concepts of bruise reduction. (In Ukraine, we obtained a request to air the films on a weekly national farmer's TV show that is watched by most of the progressive farmers in the country. The same thing could be done in Russia.)

Additionally, using catacohl, a chemical for quickly and visually enhancing fresh bruise, to show how bruise is incurred and how to reduce or eliminate it would be a dramatic and personal teaching tool. This action was very dramatic when used to demonstrate bruise to the farmers.

By making changes at the farmer's location and then taking the machine to the field for harvest and showing the reduction in bruise, we transfer technology to the farmers at a level that they can absorb and apply immediately. Farmers are totally responsive to "seeing and touching" animals, equipment, methods, technology and ideas. If they can be shown it really works and they can afford it, they will most likely adopt the "concept". In this case, 90 percent of the changes will be labor, cutting, welding, and grinding. The five percent in parts can be sourced with local items.

It would be natural to locate the initial training focus and machinery modifications with the farms that are involved in the AID supported potato storage construction projects in Russia and Ukraine. This would give farmers exposure to both good state-of-the-art potato storage and potato equipment improvements at the same time.

If changes are made in Russia first, then the lessons and what was learned could be transferred to Ukraine.

In terms of maximum impact, it would be important to have as many representatives as possible on-site during the changes to obtain as much impact as possible in reducing bruise. Two of the groups that would be important to have involved would be AKKOR and the representatives from the Ministry of Agriculture.

Farm Russia is located about a 20 minute drive to the only Russian potato harvester factory in Russia. It would be ideal to get the cooperation of the factory and use their equipment to make the actual changes in their shop. We would then have much of the equipment necessary to make the changes immediately.

If the one factory that makes two and three row harvesters adapts bruise reduction changes to their current production, improvements could be spread over large areas. The factory would also be the ideal channel for spreading bruise reduction methods through out the NIS to their customers via video training tapes.

AKKOR publishes a newspaper that is sent to farmers throughout Russia. This organization agreed to accept articles on bruise reduction that could be run as a series. This method of disseminating information would give the basics of the total bruise reduction program to numerous private farmers. It is strongly recommend that this area of education and training be followed up energetically.

XIV. APPENDICES

APPENDIX I. RUSSIAN CONTACTS

Cathy Norris
PVO/Agricultural Advisor
USAID
American Embassy
Bolshoi Devistinsky 6
Moscow, Russia
Tele: 7-095-205-2846
Fax: 7-095-205-2813

Mrs. Norris has demonstrated everything that anyone could desire in terms of a concerned facilitator of U.S. AID programs. She is helpful, courteous, quickly grasps the situations that are presented to her. She has a very good underlying understanding of the economy and the political realities of Russia. Her spirit of cooperation and encouragement is very refreshing in a difficult environment.

Vladimir Davidenko
Manager of Association Farmers of Dmitrov
(o)8-222-79688

Met with him in Dimitrov and in Moscow. He has about 50 farmers in his Association and 10 of them are potato farmers.

Igor Nickolaeirich Kuryshere
President of Dimitrov AKKOR Farmer's Group (north of Moscow)
7-095-222-74089 office and 7-095-222-37256 (These are five digit numbers.)

Met with him three times. This consultant visited his farm and saw his operation. He visited Moscow and we reviewed the bruise program.

Alexander Poryadoshny and Anatoly Larvrohen
AKKOR combine men working on the development of a one-row harvester

Call Anotoly at 7-095-141-2766.

Yuri Moiseev
President, Concern Roscar (Russian Potato Concern)
Tele:7-095-590-0383/590-3641/272-2071

Mr. Moiseev is President of the new business that is heading up the seed certification program in Russia. This business is receiving AID supported farm storages in conjunction with Farm Russia and a U.S. company, Global Steel. He was very keen to support a bruise reduction program.

Nadia Rodinor
Roscar, Moscow

Vice-President and assistant to Yuri Moiseev of Concern Roscar. She is very helpful in all areas.

Yuri Krasnov
Farm Zalugi
Moscow home tele: 7-095-398-297

Mr. Krasnov is Director of Farm Zalugi which is one of the farm locations that was to receive an AID potato storage. It was unfortunate that the storage planned for his farm had to be moved due to non-performance.

Stean Genin
Director
Farm Russia
Located south of Valdimir

Mr. Ginin's operation is a joint-stock company. It has been privatized for about five years. It is one of the most successful large operations in Russia. He has a good relationship with the potato harvester company in that he just purchased five new machines from them. He offered to introduce us to them during our time together. He was enthusiastic to support a bruise reduction program.

Pavel V. Fetisov
Vice-President
Reinbank
Russia, 125171, Moscow, 4 voikovsky projezd 6
Tele: 7-095-150-7618

Mr. Fetisov is the bank firm that is involved in supporting Concern Roscar. He does not speak English.

Ludmila Eliseeva
Potato Specialist
Concern Roscar
Tele:095-590-0383
7-095-590-3641
7-095-272-2071

Mrs. Eliseeva is a highly qualified potato specialist who knows the field well. She was always giving us extra information that was very helpful in understanding the many current problems.

Gennadiy T. Chanov
Head of Production, Storage and Processing Department
Concern Roscar
Tele: 7-095-204-4098/375-9964

He was helpful in dealing with Farm Russia on several occasions.

Brian Foster
VOCA Regional Representative Russia
VOCA, Moscow
107078, Moscow
Boyarskiy per., 3
Tele: 7-095-207-2000/921-0329/923-9889
Fax: 7-095-924-3779

Brian Foster was helpful with advice on dealing with the Dimitrov private farmer group.

Vitali Nepomjaschy
Chief Engineer
Elevatorspetsstroy
2 bld., 13, Barklay str.
Moscow, 123056, RSFSR
Tele: 7-095-145-1483
Fax: 7-095-145-5311

Mr. Nepomjaschy was helpful in discussing the overall problems in the agricultural field.

Roman Bayandurov
Elevatorspetsstroy
2 bld., 13, Barklay str.
Moscow, 123056, RSFSR
Tele: 7-095-145-1483
Fax: 7-095-145-5311

Roger Krug
Special Projects-Ag Services
Lamb-Weston, Inc.
2005 saint Street
Richland, Washington 99352
509-375-5804
Mobile: 509-545-2508
Fax: 509-375-5819

Mr. Krug is consulting on a joint venture in southern Russia to farm and build a processing plant for McDonalds. He gave an interesting presentation at a Citizens Network meeting that involved most of the non-Russian, AID potato people in Russia.

Vladimir Bashmachnikov
President
AKKOR (Russian Association of Farmers Enterprises and Agricultural Cooperative Societies)
3, Orlykov Pereulok
Moscow, 107802
Russia
Tele: 7-095-204-4027/204-4147
Fax: 7-095-208-5824

Mr. Bashmachnikov is very cooperative and signed a letter of agreement with PIP. He is an idea man. He is interested in doing projects that will actually lead to business or production. It appeared that he is open to most anything involving agriculture. He is very understanding in the problems of dealing with small farmers. This consultant met with him at least four times.

Constantine Mezentesu
Special Assistant to the President
AKKOR (Russian Association of Farmers Enterprises and Agricultural Cooperative Societies)
3, orlykov pereulok
Moscow, 107802
Russia
Tele: 7-095-204-4027/204-4147
Fax: 7-095-208-5824

Mr. Mezentesu is very cooperative with PIP. He is politically focused. (He is strongly anti-communist and very intense in this area). A great deal of advice was received from him on how to approach various problems. We met at least seven times while in Russia.

Alexander Kargin
President
AK Computer Services, Co.
Tele: 7-095-333-3612

Mr. Kargin was very helpful with some computer problems where I needed assistance in Russia. An excellent source for help with communications in and out of Russia, ie. E-Mail.

APPENDIX II. UKRAINE CONTACTS

Jim Osborne
AID Ukraine
Kiev, Ukraine
19th Floor
8/10 Kuibysheva str.
252023 Kiev, Ukraine
Tele: 7-044-220-5589

He was a tremendous help in Ukraine during my time there.

Amy Osborne
AID Ukraine
Kiev, Ukraine
19th Floor
8/10 Kuibysheva str.
252023 Kiev, Ukraine
Tele: 7-044-220-5589

Very creative individual with a good grasp of the country. She is able to give quick decisions and good support.

Marty Robinson
VOCA, Country Representative Ukraine
16, blvd. t. Shevchenka, Room 101
Kiev, 252030, Ukraine
Tele: 7-044-224-3522
Fax/E. mail: 7-044-224-3522

Mr. Robinson is doing an impressive job in Ukraine. He has an excellent grasp of many areas of Ukraine. He was of great help in answering questions of which answers would have taken a long time to track down. The information that he provided on farms in Ukraine was invaluable. We met three times on this trip.

Anatolij Kuchko
Director
Ukrainian Institute for Potato Research
Nemishaevo
Borodjanka dist.
255740 Kiev reg.
Ukraine
Tele: 41-533
Fax: 7-044-774-1542

The Ukrainian Institute for Potato Research is the receiver of the AID storage grant for state of the art potato storage being constructed in 1993. He is in a difficult position in working to keep the institute alive during hyper-inflation.

Petro Overchuk
Head of Economics Laboratory
Ukrainian Institute for Potato Research
Nemishaevo
Borodjanka dist.
255740 Kiev reg.
Ukraine
Tele: 41-533
Fax: 7-044-774-1569

The Ukrainian Institute for Potato Research is the receiver of the AID storage grant for state of the art potato storage being constructed in 1993. This man is heading up the UIPR's construction of the AID potato storage. I saw him every day while I was in Ukraine.

Igor Kholodylo
Manager
Ukrainian Institute for Potato Research
Chkalov str. 22
Nemishaevo
Borodjanka dist.
255740 Kiev reg.
Ukraine
Tele: 41-533
Fax: 7-044-774-1542

Mr. Kholodylo is the assistant to Mr. Kuchko. He is definitely the new generation of free market young men.

Vasil S. Kutsenko
Deputy Director
Ukrainian Institute for Potato Research
Chkalov str. 22
Nemishaevo
Borodjanka dist.
255740 Kiev reg.
Ukraine
Tele: 41-560
Fax: 7-044-774-1542

Mr. Kutsenko is a knowledgeable potato specialist. He is very much on the cutting edge in his thinking and understanding of seed potatoes. We met four times during this trip.

Valerij Kononuchenko
Head of Technology Department
Ukrainian Institute for Potato Research
Chkalov str. 22
Nemishaevo
Borodjanka dist.
255740 Kiev reg.
Ukraine
Tele: 41-594
Fax: 7-044-774-1542

Mr. Kononuchenko is in charge of all the field equipment at the Potato Institute. He has a well stocked shop and plenty of equipment for farming. Unfortunately, much of the potato equipment promotes potato bruising.

Boris Krasavec
Director
Kurortstroykomplex
Kiev, Ukraine
Tele: 7-044-229-5227

Mr. Krasavec is handling the actual work in the construction as a subcontractor for the Potato Institute's AID potato storage. We talked every day while in Ukraine.

Olexiy Sozinov
President
Ukrainian Academy of Agricultural Sciences
9, Suvorov str.,
252010, Kiev-10
Ukraine
Tele: 7-044-290-1085
Fax: 7-044-226-3284

Talked with his secretary when he was in the United States.

Ivan V. Shabliy
Assistant to the President
Ukrainian Academy of Agricultural Sciences
9, Suvorov Str.,
252010, Kiev-10
Ukraine
Tele: 7-044-290-1085
Fax: 7-044-226-3284

Mr. Shabliy was very helpful in obtaining a multiple entry visa for this consultant which took about one hour once he had appropriate documents ready. This is the second time he has assisted this consultant.

Oleg Gusev
Reporter for largest business newspaper
Kiev, Ukraine
Tele: 7-044-290-6000

Mr. Gusev published a story with pictures in the largest newspaper (2.5 million) in Ukraine on the PIP program with AID while this consultant was in the country.

Wynn Henderson
Grain farmer in dry farm area of Idaho
Farm Management Specialist
407 4th Avenue
Lewiston, Id. 83501
Tele: 208-743-9110

Mr. Henderson was with VOCA in Ukraine assisting private farmers. He was a perfect match for the grain farmers in that the grain growing areas that he has experience with in Idaho are identical to those in Ukraine. Even the weeds are the same in both areas. We talked several times before going back to Ukraine this time.