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**POSTHARVEST INSTITUTE FOR PERISHABLES**

**RECOMMENDATIONS ON REORGANIZATION**

of the

**UKRAINIAN INSTITUTE FOR POTATO RESEARCH**

for

**USAID/NIS**

**Prepared by**

**Dr. Ron Curtis  
Dr. Thomas Armor  
Dr. Bob Dwelle  
Dr. Joe Guenther  
Mr. Taras Ogiichuk**

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## **I. Executive Summary**

Political and economic changes continue to work their way through Ukrainian society. Some major policy changes required to guide a market based economy have been delayed or enacted piecemeal. In the agricultural sector new policies have been incomplete or postponed, reflecting fears that a rapid dismantling of the system of state and collective farms would cause a collapse of food production.

Evidence is very strong that severe structural problems were hidden by tight administrative control of production and compensating subsidies. This became evident in the potato industry when controls and subsidies were eliminated.

This paper reviews the current and potential function, form, role, and ownership of the Ukrainian Institute for Potato Research. A brief examination of the current state of the potato industry, with special attention to the role of seed potato, establishes the context for the review and recommendations.

Seed potato production follows a different path from most commercial crops. Whereas botanical seed is the normal path, and requires "simpler" seed production technology, potato seed is a tuber itself. Lower multiplication rates, seed borne diseases, and high transport and storage costs are characteristics which set it apart from other seeds. A system to constantly replenish disease free seed stock and produce sufficient quantity, at economic prices, requires more time; six to ten years is the cycle from tissue culture to commercial growers.

Even though the seed material is disease free when it leaves the Potato Institute, the system for multiplication cannot keep diseases in check. Therefore, yield rates of Ukrainian potato seed average about 1:3 kg (1 kg seed yields 3 kg); in the western United States the yield rate ranges from 1:15 to 1:25. Improved production practices will not significantly increase these yields until planting material improves.

Patents of potato varieties to establish private rights are difficult to establish and enforce. Ukrainian varieties are "public" --no royalties can be charged. This is the same practice in the United States for many commercial potato varieties.

The present organization of the Ukrainian Institute for Potato Research (in the text, may be referred to a Potato Institute or Institute) reflects its role in an administered system of seed production. Under a market-driven system of seed potato production, a new organization is required but one which continues to provide a strong science foundation.

## Recommendations:

It is recommended that the Potato Institute remain in government ownership. The public varieties now in use will not generate the necessary income; future, patented varieties would produce royalties only in the distant future and only if a system of royalty payments can be institutionalized in Ukraine. A private company would fail without continued government subsidies.

A government entity would be tightly focused on two roles: (1) research, breeding and selection, and (2) production of high quality seed stock for sale to the private sector for multiplication.

The potato industry in the Pacific Northwest of the United States operates under similar conditions. A partnership between government and the private sector assures the continuing supply of high quality seed potatoes. A cooperative program between the Institute and the University of Idaho would facilitate the formation of a similar system in Ukraine.

## **II. Background**

The political and economic changes following independence are continuing to work their way through Ukrainian society. Some major policy changes required to guide a market based economy have been delayed or enacted piecemeal. In the case of the agricultural sector, new policies have been incomplete or postponed, reflecting fears that a rapid dismantling of the system of state and collective farms would cause a collapse of food production. There is also a body of opinion which sees these problems as transitory, requiring only changes in technology; major shifts in the structure of the agricultural sector are not warranted, according to this view.

Evidence is now very strong that severe structural problems were hidden by tight administrative control of agricultural production and compensating subsidies. Distorted consumer choices led to consumption patterns which did not reflect real prices; production quotas to meet these artificial demands did not reflect the economic value of inputs. Once prices were left to seek a free market clearing level, and subsidies reduced or eliminated, structural discordance was unmasked to reveal new relative prices.

Production decisions are changing as consumers respond to new prices and falling incomes. Potato production shifted from large scale mechanized production on state and collective farms to backyard plots, underscoring the role of potatoes as the "second bread of Ukraine." This shift in production is caused by two fundamental, seemingly paradoxical reasons:

1. Potato prices are too low for most growers.
2. Potato prices are too high for most consumers.

## Changing Policies

Today, two and one-half years after independence, the need for new agricultural policies is more apparent. Early attempts to privatize large state and collective farms were frustrated. Privatization of other sectors of the economy has moved forward albeit at differing paces.

The budgetary requirements to maintain the state system of agricultural institutions is at odds with fiscal and monetary policies to stabilize the exchange rate and reduce inflation. This adds a stimulus to privatization as severe budget cuts, with the prospect of large public personnel reductions, are imposed. Also, the Academy of Agricultural Sciences is reviewing member institutions as candidates for privatization; those which provide research, breeding, and variety selection for seeds are logical enterprises for privatization. Three have been designated for privatization under a pending World Bank supported program.

The specific target of the government and World Bank program is to stimulate the formation of a seed industry which performs according to international standards. A recent World Bank Appraisal Report summarizes the long history of seed production in Ukraine and its role as an exporter of seeds. Favorable weather conditions and well-trained scientists support a comparative advantage in Ukraine for seed production. Appropriate economic policy and efficient systems of organization and management are not in place, constraining the formation of a market-oriented seed industry.

The importance of seed in general is underscored by the role of variety improvements in accounting for productivity increases over the past half century, according to the same World Bank report. Half of the increase in agricultural production is attributed to improved seed. However, experts say that potato yields have not demonstrated the same results; those yields have been flat over the past twenty-five years.

Seed potato requirements have been met by an administered system of research, breeding, and variety selection, linked to state and collective farms for seed multiplication. The Ukrainian Institute for Potato Research has served as the foundation and first link in this chain. But the economic and policy changes following independence have disrupted this system. What will eventually emerge is not yet clear.

### **III. Problem Statement**

This is a review of the current and potential function, form, role and ownership of the Ukrainian Institute for Potato Research. The review was requested by the Institute and endorsed by the Academy of Agricultural Sciences.

What are the changes required of the Institute as Ukrainian society moves from a command economy toward one based on free market principles? How is the potato industry

re-structuring itself now and into the future? Will the seed potato production system need the Institute to provide basic seed stock?

These essential questions are raised at a time of severe financial hardship for the people of Ukraine and reduced budgets for government. Budget reductions have been made recently at the Institute, and further reductions, including personnel, are contemplated. Other similar seed research and production institutes are under consideration for privatization. Is this the best path for the Institute as well?

#### **IV. Analysis and Findings**

Any re-organization of the Institute will depend on its role in a new seed production system. An understanding of the scientific and economic problems of the current seed potato industry will suggest the necessary functions for the Institute. Examination of current organization and operation of the Institute within the administered seed production system--as designed for the command economy--will suggest a future role.<sup>1</sup>

##### **Biology of Potato Production**

Science is increasingly a critical and intensive factor of production in modern agriculture. High productivity in the agricultural sector is required of any society to provide a cheap and abundant food supply for its citizens. Science releases labor from low wage agricultural employment to professions which can pay higher wages; the remaining jobs in agriculture pay higher wages. But scientific improvements are constrained by nature and economics.

Continuous investment in agricultural research is also a form of insurance, especially for important food commodities. The Irish potato calamity in the 19th century was precipitated by "late blight," a deadly potato disease for which there was no remedy. A

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<sup>1</sup>Two private sector models dominate seed potato production and sales worldwide. They diverge on the questions of patents and royalty payments. If private research produces commercially valuable varieties, then patents are awarded. Publicly funded research produces publicly owned varieties; no patents are awarded and any grower can use them. Private companies recoup the cost of research and development through price and royalties on their own varieties. There is a strong incentive for these firms to aggressively promote their products. This is the European model for seed potatoes.

Public varieties of seed potatoes dominate the commercial market in the United States and no one firm can claim exclusive rights over these varieties. In this second model, continuing research and production of basic planting material is done by government agencies. The cost of research is borne by the State; production costs are re-couped from sales of nuclear seed to seed growers. As royalty payments cannot be charged, the seed industry tends to have a large number of smaller firms, increasing competition.

constant search for disease resistant seeds, or planting material, of varieties which also meet productivity goals and consumer tastes, is an on-going necessity. Who pays for this research, government or private firms, depends on the kind of research, the specific food crop, and public food policy.

The biology of potato plants presents unique features for seed production, setting it apart from other commercial crops. Most other crops are grown from true botanical seed, which is very small, transports easily, and multiplies a hundred fold in a single generation; and it is relatively easy to protect from seed borne diseases. The ease of multiplication and low transport costs leads to "simpler" seed production technology.

In contrast, seed potatoes are not true botanical seeds but potato tubers. Large and bulky, they are far more expensive to store and transport. Multiplication is not measured in hundredfold; in the western United States a kilo of seed potatoes will produce 10 to 15 kilos under good conditions with good farm practices. And because the seed is a tuber, diseases acquired in the field accumulate from one generation to the next.

In Ukraine, the Institute is the initial step in an administered system of seed production for state and collective potato farms. (The system is described below in the Management and Organization section.) Research programs support breeding and selection of new varieties; *in vitro* planting material of those varieties is turned over to experimental farms for field multiplication.

Seed quality deteriorates quickly as it leaves the hands of the scientific staff of the Institute. Multiplication is taking place in areas of commercial potato production and common diseases are quickly acquired by the seed stock. As subsequent multiplications take place, up to 10 years to obtain the quantity of seed necessary to meet production quotas of table potatoes, seed stock becomes hopelessly diseased.

It appears that seed quality was abandoned as a meaningful indicator. Although a seed certification system is in place, the standards utilized permit far too high an incidence of pathogens. Only the earliest generations of seed potatoes retain some of the disease free qualities of the initial multiplication. To compensate for the low productivity of this poor quality seed, planting rates had to be increased to meet production quotas for table potatoes. These rates are reported to be four metric tons (mt) a hectare, about twice the rate in the United States.

Key members of the professional staff of the Institute are superior scientists and the linkage of research to breeding and selection has been productive. The problems with low quality seed are introduced into the seed production system after the planting materials leave the direct control of the Institute. (The Institute should maintain *in vitro* multiplication of potato plants as the first step in any seed production program to assure the initial quality of planting materials.)

There are potential economies in the breeding and selection programs to be realized by reducing redundancy. The Institute is not the only location of seed breeders; genetic crossing is done in at least eight locations. Such crossing should be reduced to no more than four locations and could probably be reduced to two. Advanced testing and selection is needed in each major potato production region of Ukraine. However this work should draw on genetic material from fewer breeders.

### Economics of Seed Potato Production

Free market prices for potatoes have uncovered the structural inefficiencies of the system which supplied potatoes to Ukrainian consumers. The consequences can be seen throughout the industry, down to the supply of seed potatoes. Collective and state farms, along with a smaller number of private farmers, are now making production decisions based on prices derived from consumer decisions in the marketplace. The administrative system which produced seed potatoes for delivery to potato growing collectives and state farms now plays a much smaller role; a few state and collective farms are producing potatoes on government order for public institutions such as the military and hospitals. Most consumers no longer buy potatoes, electing to grow potatoes for home consumption.

The result, since 1991, is that potato production on state and collective farms has fallen dramatically to about 2.3 million mt. Now 12.5 million small backyard growers, urban and rural, account for about 88 per cent of total production, with an estimated 17.1 million tons. Most of this production is for home consumption. Only ten of the estimated 300 larger private farms elected to grow potatoes in 1994. This shift in production from large mechanized farms to small backyard plots has produced very little change in total production or yields.<sup>2</sup>

Seed potatoes are the largest variable cost of growing potatoes. In the United States and Europe commercial growers spend about ten to fifteen percent of gross revenue on seed. In Ukraine, that figure is about 50 to 70 per cent, depending on the prices quoted for seed and product.<sup>3</sup> The very large difference in this key indicator is the result of several factors.

Comparisons with other production indicators from the U.S. further illuminate the problem. Potato growers in the United States use about one-half the seeding rate as in Ukraine and the yields from that seed are at about 15 to 1, five times the average rate in Ukraine. This accounts for most of the difference in the seed cost ratio cited above. Specialized seed growers multiply seed at ratios of 10 to 1, three times the rate in Ukraine.

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<sup>2</sup>Ministry of Statistics. "Agriculture of Ukraine, 1993." as reported in World Bank Report. Average yield per hectare for 1986-1990 fell to 11.9 mt from 12.2 mt; total production increased to 20.3 million mt on 1.7 million hectares.

<sup>3</sup>At the time of the study, the ratio of table to seed potatoes was 3:1.

Ten years of production of seed potatoes in Ukraine can be produced in the United States in four or five years. The lower rates of multiplication of seed and the longer multiplication periods, explain the relatively high cost of seed when compared to yield. The combination of biology (limits on yield caused by disease) and economics (market prices) is making potato production unprofitable for Ukrainian producers.

The shifts in production from state and collective farms to backyard growers are due to the following reasons:

1. Prices are too low for most growers.
2. Prices are too high for most consumers.

The market equilibrium price--which is unsatisfactory for consumers and producers--is explained by low income of consumers and low profits from potato production for farmers. Profitability cannot be increased without higher quality seed potato.

### Economic Effect of Low Seed Quality

The quality of the seed stock, when it reaches commercial growers, is the cause of the economic paradox of market prices that drive commercial growers out of the marketplace and consumers to home production plots. Once seed is multiplied sufficiently for the quantity needed to produce table potatoes, the yield potential is diminished to a low average of 3 to 1.

In order for potato producers to reduce their seed costs to a comparable level as found in the United States--10 to 15 percent of total revenue--the market price of potatoes would have to rise about five fold. At such prices consumers would drop out of the commercial market altogether. The other option, which is reported to be used by some growers, is to import seed. With higher yields from higher quality imported seed, potato production may be profitable even at low consumer prices.

The solution to this problem is not higher consumer prices. The solution is having a quality seed potato with higher yields to provide a profitable return to producers at prices that consumers can afford.

## **V. Management and Organization Analysis**

The Potato Institute is one of several scientific institutes within the Academy of Agricultural Sciences, which itself reports to the Council of Ministers. These institutes each have specific responsibility for basic and applied research in support of priorities set by the State Committee for Science and Technology. This is distinct from direct “production” support which--in the case of potatoes--resides with the Ministry of Agriculture and Food.

We must state clearly that the Institute’s major capital resource is the body of scientific professional staff it has recruited, supported and maintained. The value of this “asset” is difficult to establish in the typical accounting sense, yet it is the most important element of the Institution. Only with great caution should any decisions be taken that risks dismembering this unique resource and under-valuing its potential role to the future of Ukrainian agriculture.

The Institute is a key player in the production of seed potatoes, but defining just where the Institute starts and ends, both functionally and organizationally, is not clear. The Institute staff described the essential steps, locations, and key parties involved in the complex process of producing seed potatoes. Many of these steps are controlled by the Institute, some are loosely related to the Institute, and still others would be described as external to the Institute by western organizational practices. At this time of transition from a command economy to one of free markets and enterprises, there will be some necessary confusion about the boundaries of public institutions.

What is clear is that the Institute has the sole responsibility for production of disease-free planting material which is the first step in the production of seed potatoes. From this beginning a set of administered relationships with experimental farms and state and collective farms eventually results in seed potato production. The extent of the authority of the Institute over this process is not clear.

Based on the actual physical flow of materials and seed, what follows is an abbreviated description of the seed production system as understood now. It is not clear how much of this system is actually functioning at the levels indicated, since demand is much lower now. (Institute production of *in vitro* material has dropped to 35,000 vials from 100,000.)

- a) Breeding is done by at least eight breeders at eight locations.
- b) Selection is done at many different sites, matching variety selection to growing conditions.
- c) When a new variety is identified, the Institute does the necessary initial laboratory work and then multiplies it *in vitro*.

- d) *In vitro* cultures are then sent to 17 laboratories for development of micro-tubers. These laboratories are located at 17 Oblast Experimental Farms.
- e) The resulting micro-tubers are then delivered from these 17 laboratories to 22 "Support Stations," each of which is on a small part of a state or collective seed farm. These are in designated "Closed Regions" for disease protection. The small staff at these "Support Stations" nominally report directly to the Institute. There are three similar Experimental Farms wholly owned by the Institute that receive micro-tubers as well (Nemishaevo, Chernigov, and Zhitomir). These 22 "Support Stations" and three Experimental Farms (Institute owned) multiply the seed at least two generations.
- f) The resulting seed is sent to (about) 72 "Elite" seed farms. Forty of these are connected with the Academy of Agricultural Sciences and 32 are associated with other institutions and universities. At this stage three to five generations of seed are grown.
- g) The seed is then sold to about 350 seed producers (state and collective farms) who produce at least three more generations before it is sold to other commercial growers.

Ownership of the materials seems to pass from the Institute somewhere within step "e," when the micro-tubers are given to the 22 "Support Stations." The ownership and eventual disposition of the seed going to the three Institute owned Experimental Farms is unclear. The first "sale" appears to take place between steps "e" and "f." Only nominal payments are made for *in vitro* planting material, the most valuable ingredient in the production of seed potatoes.

The ambiguity of ownership and control over materials and facilities seems to be a salient legacy of state ownership of everything. The physical facilities and assets which belong to the Institute seem to be in three locations: Nemishaevo (location of the headquarters of the Institute), and the two Experimental Farms, one at Poleski and the other at Chernigov.

The Institute is currently organized as follows: (estimated staff numbers)

Office of Director

- Research (125)
  - Selection (55)
  - Seed Breeding (25)
  - Storage (10-15)
  - Technology Development (30)
- Construction (8-10)

- Co-ordination and Administration (20)
  - Experimental Farm at Poleski (30 )
  - Experimental Farm at Chernigov (30)
  - Production Farm (?)
- Information (15)

The availability of time and logistical constraints did not permit on-site review of the actual activities of the Institute divisions and staff. The table of current organization and staffing levels was developed by dialog with a representative group of Institute professional staff and Deputy Directors. Budget figures were requested, but were not made available.

During the review (early April 1995) it was announced that the Institute budget for next year was approved at 40% less than the current budget. The organization described here does not reflect this new budget. When asked if the budget reductions would be effected in an "across the board" approach, or if decisions by program would be made, the senior Institute official responded it would be by program .

A group of 14 Institute professionals and Deputy Directors were assembled to meet with the PIP team during the last part of the data collection phase to provide information, clarification and general comments. One activity conducted with this group had them break into four small, randomly assigned groups to discuss two questions and report the results to the larger group. This was not a familiar management technique for the staff. However, they agreed to the design and with some effort by everyone, and skillful translating, it was completed.

Before the questions were posed to the small groups the "new" realities facing the Institute were briefly reprised:

- The people of Ukraine have committed to transition from a command economy to one of free markets and privatized enterprise,
- The new budget for the Institute had, just days earlier, been reduced again, this time by 40%.

The questions then posed for their small group discussion were:

- A. What should be the mission of the Institute now and in the future?
- B. List, in order of importance, the 3-5 priority functions of the Institute?

A synopsis of the oral reports from the groups is in Appendix A. An important result of this exercise was to confirm the high priority given to basic science, variety breeding, and selection. The lower priorities were functions like potato processing technology and development of new mechanical equipment.

## Implications of Organizational Analysis

The organization of the Institute fits what appear to be the tasks assigned under the centralized command structure. Management of the assets of the Institute cannot be assessed with the experience at hand or within the time available. The administered system of seed potato production is, on the surface, an engineered cooperation to produce a desired product. There are many elements working in sequence and parallel toward a centrally defined target, but accountability and responsibility are difficult to assign at the many steps along the way.

The Institute will need to focus its reduced resources on its own critical, though limited, role in this all important effort to develop more productive potato seed in Ukraine. The Institute would do well to divest itself of all functions that are not directly supportive of this narrowly focused role.

The existing seed production system is a complex set of relations between the Institute and other quasi-public institutions and seed growers that multiply seed for several generations. For the most part this system does not currently seem to recognize input costs very well, yet it is increasingly subject to market prices. The Institute will need to re-align itself with only those immediate parts of the system that will be the direct “buyers” of the Institute “products” and do so on the basis of market prices.

The Institute internal structure needs to reflect a reduced and somewhat changed set of functions. It would need only two divisions, one to carry out research and *in vitro* multiplication, and the second to manage the field replication work and marketing of both the *in vitro* material and the new high quality seed.

## **VI. Conclusions**

Low wages and relatively high potato prices cause consumers to grow their own potatoes. As the economy recovers and employment opportunities expand, with higher wages it is likely that backyard production will be sharply reduced. Therefore, government policies put in place to support the potato industry should not be based on current production patterns.

The future of the potato industry in Ukraine rests, first and foremost, on the question of seed quality. This is a complex and technology intensive industry. Ukraine has the intellectual capital now, within the Institute, to provide the science foundation. The essential and necessary elements of a seed potato industry are:

- Research to support breeding and selection
- Capability to produce disease free seed stock
- Specialized seed growers to multiply seed stock into high quality seed
- A seed certification system to provide seed buyers necessary information
- Free functioning markets to establish prices

The scientific expertise exists within the Institute to address the first two requirements of a new industry. They could also have an important role in assisting private seed growers with the production technology necessary to maintain high quality when multiplying seed stock. The last two functions are not the responsibility of the Potato Institute.

As public policy is formulated to privatize the agricultural sector, the importance of potatoes in the national diet is expected to lead to government policies designed to stimulate a potato industry in the private sector. However, this paper strongly recommends that application of privatization policy for seed potatoes be done in a way which fits the scientific and economic requirements of the industry. Precipitous application of the policy could result in the loss of a functioning system of research, breeding, and selection necessary for production of seed stock as well as the opportunity to develop and apply new technology in the production of high quality seed potatoes. The Institute should remain a government entity. Otherwise, the organized capability to conduct research on potatoes for the purpose of breeding and selecting new varieties will be lost.

Our analysis suggests that privatization of the Institute would fail because there is little to sell in the short-term to generate the necessary revenue for self-sufficiency. At present, the Institute produces *in vitro* planting stock which could lead to high quality seed potatoes. But the earliest revenue could be generated from an improved quality seed is two years--the time required to transform *in vitro* material into early generation seed. Additionally, the Institute does not now have "private" varieties which could generate income from royalties. Providing a subsidy to a new set of private owners to assure profitability in the short term would be counter to the philosophy of privatization policy.

## VII. Recommendations

In the process of privatizing the potato industry, the government should assure themselves that the necessary science foundation for disease-free planting material is protected. The Institute is needed, it is concluded, to serve the private sector, with these roles:

- a) provide research, breeding, and selection of potato varieties
- b) produce and sell *in vitro* materials to the seed industry
- c) produce field multiplied early generation seed

The UI/PIP team recommends that the Institute be retained as a public agency to maintain the scientific foundation for potato research, breeding, and selection. The national interest is best served by continued government involvement in the seed potato industry. This alone, however, is not sufficient to create a vibrant private seed potato industry.

Other actions have to be taken to avoid the economic ills of a government monopoly in seed stock production. For example, seed imports should be permitted, subject only to meeting reasonable phytosanitary standards. The presence of imported seed would serve as a benchmark for seed quality and a ceiling on the price the Institute could charge for planting material. Also, private brokers of clean seed stock, who in turn sell their product to potato growers, will have to emerge.

As public varieties dominate commercial potato production, it is suggested that the "Idaho" model (see Appendix B) be used as a guide. This model not only provides the scientific foundation for potato research, but also provides disease-free seed stock from public varieties to the private sector.

The Institute has the necessary scientific expertise to provide a Ukrainian private seed potato industry with disease-free planting material. The Institute should undertake a new role that maximizes its own comparative advantage in a free market system of seed potato production. But to best serve a private sector environment, the Institute requires re-organization and a new focus.

The roles suggested for the Institute are:

- Continue research and production of *in vitro* material. (This is used for limited field multiplication.)
- Multiply the *in vitro* stock for two generations in disease free, isolated land to produce nuclear seed.
- Encourage a new seed certification category for this new, disease free seed.

- Market this seed to selected seed growers who will understand its value and maintain its quality.
- Train seed growers in new production technology to keep disease in check during multiplication.

The Institute would be narrowly focused on the specific roles above and organized along the following lines:

**Director**

- Research & Product Development (research, breeding & selection)
- Production and Marketing
  - Production (multiplication *in vitro* and at “disease free” site(s))
  - Marketing (market information, pricing , technology transfer)

The intent of a “new” organization mentioned above is to have the Institute concentrate its resources only on those core functions it does best and with which it has a distinct comparative advantage. Activities and resources not directly supportive of these core functions should be eliminated.

The “Research & Product Development” division would perform the underlying research, breeding and selection functions. The suggested title of this division is borrowed from private industry and is offered here to link to actual products that will go market. It would be staffed with the range of scientific disciplines needed to support a complete program of research, breeding, and selection.

The “Production and Marketing” division would sell high quality, disease-free basic seed. This ties the Institute to the market forces that determine the demand and use of its product (seed planting materials). The product would include service--teaching and demonstrating to growers, the technology needed for productive multiplication. The linkage of Production with Marketing, both reporting to a single manager, would support this “technology transfer” best.

The Production section would be responsible for the in-ground multiplication work done by the Institute in “disease free” sites. This new site(s) would have to be identified, rights to its use negotiated, and then managed to keep it disease-free.

The Marketing section would have a dual role. It would research the potato and potato seed markets and the changing structure of the potato industry as privatization continues. This information would be used by the Institute and its “clients” (e.g. seed growers) to adjust to expected demand. Its second role would be to develop new markets, including export markets.

A vibrant potato industry depends on the availability of high quality seed potato. The potential to produce this product exists now in Ukraine. But if decisions taken today disperses the scientific talent which is now gathered in public agencies, it will be difficult and expensive to re-create.

## **Appendix A - Synopsis of Small Group Oral Reports**

### **Question 1: Main directions**

#### *Group 1*

- to provide the development of the science
- provide scientific-informational and methodological selection and seed breeding services

#### *Group 2*

- selection
- seed production
- production technology, storing and processing

#### *Group 3*

- conducting research
- providing science
  - a. high-quality seeds
  - b. technology
  - c. storing
  - d. necessary money flows
- tight connection with other potato producers and foreign companies

#### *Group 4*

- to create not only our potato market, but also protect ourselves from import, thus the function of management should be developed
- provide good scientific base for the potato industry
- systematic analysis should be used for development

**Question 2: Main priorities.**

*The most important items:*

- selection of the potato varieties and seed production
- fundamental research
- production of high-quality and high-productive potato seeds
- highly effective potato technologies

*The less important items:*

- selection of the potato varieties, which can be used in the potato processing
- machinery system
- education of a new scientific staff

*Group 1*

- selection of the potato varieties and seed production
- storing, processing, diminishing of losses, energy- and resource-serving technologies
- selection of potato seeds for processing

*Group 2*

- fundamental research
- marketing research and informational supply
- selection and reorganization of selection work
- minimization of losses by creating proper storing and processing
- machines

*Group 3*

- high-quality seeds, resistant to diseases
- resource-serving technologies for large and small producers and for different zones of Ukraine
- incentives for processing industry to use varieties, which are being created by Institute

*Group 4*

- high-quality potato growing technologies
- selection
- developing new potato varieties
- processing
- extension service

## **Appendix B**

### **Idaho System of Public and Private Co-operation in Seed Production and Certification**

#### **Seed Research, Breeding and Selection**

In the United States most important commercial varieties of potatoes are not patented and royalties cannot be charged. This has led to an approach to potato variety production that is a cooperative venture between government and the private sector and is the model used in Idaho. It is based on the premise that a private company, without exclusive rights to a certain variety, would not produce new varieties for sale.

The University of Idaho cooperates with the federal government in research, breeding, and selection of new varieties of potatoes at public expense. Selected public varieties, when released for use, are produced by the College of Agriculture. Seed stock is sold to private growers at a price which recovers only the cost of production of *in vitro* planting material and one field generation. In Idaho the price is set by the College of Agriculture with advice from an industry advisory committee. Agricultural political interests are well represented in the state legislature which has budgetary control and oversight of the University. The actual costs of the research, breeding, and selection are, in effect, paid by state and federal governments through grant programs and tax support of the University.

Under the current seed production system in Idaho, the University of Idaho completes production through the first field generation. The seed tubers from this first field generation are sold to private farmers who multiply this seed through 4 or 5 additional field generations (identified as "Generation 1" through "Generation 5"). A price for seed of different generations is established in the marketplace. It is determined by supply and demand of seed potatoes and the expected price of table potatoes. The commercial farmers (those who produce potatoes for eating and processing) will generally purchase Generation 4 or 5. Some commercial farmers pay the higher price for Generation 3 because it has higher quality (less disease) and will produce higher yields. In past years the University of Idaho produced the first three field generations of potato seed. However, as private potato seed growers became adept at the technology of clean seed production, the University reduced its production to only two field generations and then to only one field generation.

## Seed Certification

Certification of seed quality is done by the Idaho Crop Improvement Association, which is authorized by the state government, but operated by the potato growers themselves. It is self supporting from the fees it charges seed growers for the certification service.

The certification process requires 5 inspections: 2 in the field, 1 as the seed potatoes are placed into storage, 1 as the seed potatoes are brought out of storage for sale and shipping, and 1 winter test. The winter test consists of seed samples that are taken to a warm climate in southern California and are planted in the field for further inspection. The field inspections involve both visual examination and laboratory tests.

Some diseases and pests have a “zero tolerance,” meaning that none is allowed. If even a single plant is found with bacterial ring rot, for example, all potatoes that particular farmer produces are disqualified for seed certification. In this case, all of the farmer’s seed must be sold for eating, and the farmer must start with all new seed materials.

Other diseases have a specific maximum level allowed for certification. The level of disease allowed for each successive generation increases slightly because it is impossible to keep potatoes free of all diseases under field conditions. The amount of disease allowed in the first field inspection is slightly higher than that allowed in the second field inspection. If a farmer has diseased plants in the field during the first inspection, even at a low level, it is assumed that he will remove many of the diseased plants from the field prior to the second field inspection.

If disease levels are too high during field inspections (above the maximum allowed), the seed is downgraded to a later generation. For example, if a seed farmer is growing Generation 1 seed but he exceeds the maximum disease allowed, his seed will be downgraded to Generation 2, if the disease level meets qualifications for Generation 2. If even a single disease is too high for a category, the seed will be disqualified from that category.

## **Appendix C: Methodology**

The methodology of this report follows the scope of work developed in January 1995 when Dr. Ronald Curtis and Mr. Taras Ogiichuk spent 10 days defining the issues and tasks with the Director and staff of the Potato Institute. Although the original scope of work called for a larger team and more time in-country, the work actually completed is close to the original plan. Planned visits to branch stations and interviews with non-Institute staff were limited.

The data collection methodology underlying this report is based for the most part on interviews and meetings with many of the professional staff of the Potato Institute. The key exception was the unavailability of Director Anatoli Kuchko due to illness. The team also met twice with Olexiy Sozinov, President of the Ukrainian Academy of Agricultural Sciences. Due to the illness of Valery Konounchenko, only one meeting with him was possible to discuss details of the Small Farmer Center.

After an initial organizing meeting, the Postharvest Institute for Perishables (PIP) team and the Institute group broke into two smaller groups. The first focused on the scientific issues of potato seed research and early multiplication methods (Drs. Curtis & Dwelle from PIP). The second addressed seed production technology and the economics of production and marketing of potato seed (Drs. Armor, Guenther and Mr. Ogiichuck from PIP). These two groups met separately over several days time reviewing and analyzing their respective issues.

The PIP team met daily among themselves to integrate the information being developed and to form working hypotheses about the issues, problems, and potential solutions. At the end of 10 days a joint meeting of the PIP team and Institute staff was held to review the preliminary information, clarify issues, and try to resolve ambiguities in the information as understood by the PIP team. A second meeting was scheduled for the following day to actively involve the Institute staff in identifying important priorities for their institution (described in the Organization and Management Analysis section.)

In addition to this face-to-face data collection, the team had the benefit of these resource documents:

Ukraine Seed Development Project, Staff Appraisal Report, IBRD - February 3, 1994

Ukrainian Privatization - the Most Efficient Way, Larissa Tomashevskaya, April 1995

Trip Report - Russia & Ukraine, Harvey Neese and Taras Ogiichuck, PIP, March, 1994

Privatization Documents and Information, Philip Hungerford *et al*, USAID Ukrainian Privatization Technical Assistance Program, 1994

## **Appendix D: Report Authors**

### **Team Leader: Dr. Ronald V. Curtis.**

Ronald V. Curtis served as an Agricultural Development Officer for the Agency for International Development in several countries. He holds a Ph.D. in Economics with specialization in Agricultural Economics, Economic Development, and International Trade and Finance.

### **Management: Dr. Thomas H. Armor**

Dr. Armor holds a Ph.D. from the University of California, at Los Angeles in Management. He is a management consultant working with both private and public organizations. He has worked in the field of management and organization development to improve economic development projects for twenty years. He has worked in over fifteen countries, including three previous trips to Ukraine in 1994.

### **Agricultural Economist: Dr. Joseph F. Guenther**

Dr. Guenther is Professor of Agricultural Economics at the University of Idaho, with a three-way appointment in extension, teaching and research. His area of emphasis is the economics of the potato industry. Dr. Guenther was born on a potato farm and has been involved with the potato industry his entire career. He has experience as a potato grower, researcher, educator and industry consultant. Dr. Guenther earned his Ph.D. at Washington State University. In 1993 he was a Visiting Scholar at the University of Cambridge in England where he conducted research on the European potato industry. He has published more than 200 articles in academic journals, University publications and trade journals. He writes a monthly column for SPUDMAN magazine and is a frequent speaker at potato industry meetings in Idaho, the US and overseas. This is his second trip to Ukraine.

### **Agricultural Scientist: Dr. Robert Dwelle**

Dr. Dwelle is Professor of Plant Physiology and Chairman of Plant Sciences at the University of Idaho. He received his Ph.D. from the University of Montana in 1974 and has been working with potatoes for 21 years. Much of his research on potatoes has been done in support of the potato breeding program at the University of Idaho, which provides genetic material for about ten western states in the U.S. Dr. Dwelle also teaches classes at the Univ. of Idaho in Crop Physiology as well as Potato Science (the science of potato breeding, production, management and storage). This is his second trip to Ukraine.

**Marketing Specialist: Taras Ogiichuk.**

Mr. Ogiichuk has a degree in Agricultural Economics and Accounting from Kharkov Agricultural University, Ukraine, and a MBA from Washington State University. He has been a staff employee of the Postharvest Institute for Perishables since July, 1993 in support of the PIP program in Russia and Ukraine. His tasks have been directed to communications, marketing, training, and field support for improved storage systems.