ENVIRONMENTAL ASSESSMENT

Norsk Hydro Farm Supply Centers

Ukraine

Under the Auspices of

the Citizens Network for Foreign Affairs, Kyiv, Ukraine

and

the United States Agency for International Development

Cooperative Agreement No. 121-0006-A-00-6238-00

Agribusiness Partnerships II Project

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1) SUMMARY

The objective of this Environmental Assessment is to bring Norsk Hydro?s Farm Supply Centers into compliance with current and planned environmental regulations of Ukraine, and pertinent regulations of the United States Agency for International Development, 22 CFR Regulation 216. This document is based on the Initial Environmental Examination, various CNFA/USAID reports and memorandums, on local authorities? inspections and several site visits by CNFA personnel. Many interviews and discussions with Norsk Hydro (NH) personnel have occurred regarding the Environmental Assessment. All the pertinent licences and permits for operation are in order. Norsk Hydro surveyed fertilizer warehouses throughout Ukraine and chose twelve organizations with whom to negotiate for partial business rights. At five warehouses, NH purchased more than 51% of shares. Remodeling needs and environmental assessments for all warehouses were completed and quarterly reporting will suffice for monitoring requirements about infrastructure and management progress.

1.1 Mitigations and Recommendations

The following list of mitigations is stipulated for integrated agricultural farm supply centers. Norsk Hydro has related that it is only involved in the mineral fertilizer business. However, it was observed that one of their five warehouses has 2-4-D herbicide stored in it. Norsk Hydro states in its application, that in order to facilitate success in the difficult economic situation of Ukraine, a certain amount of ?vertical integration? is necessary, e.g. other agricultural supplies will be provided their clients, such as seeds, pesticides etc. through other companies. Since not all of these details are known at present, this EA provides some guidelines for pesticides as well as fertilizers. Importantly, some of their fertilizer warehouses are a part of ?Agrochim? complexes designed by the USSR, where separate warehouses for fertilizers and pesticides are located on the same parcel of land, usually near railheads and arterial highways. Since Norsk Hydro is not directly involved with pesticides, there can be no specific requirements for pesticide management and mitigations placed upon the company. However, since Norsk Hydro?s partners are involved in the storage and management of pesticides, and sometimes in the same warehous(e) or in adjacent buildings, we are including in this Environmental Assessment, the USAID guidelines on pesticide management so that Norsk Hydro can provide this information to their partners. The storage of herbicides in the same warehouse as fertilizers is contrary to good practice of agrochemical storage. Not only do certain mixtures of volatile fertilizers and herbicides pose explosive fire dangers, but if herbicides were mixed accidentally with fertilizers, it would create chaos in crop production, and ruin the reputation of Norsk Hydro if either the wrong chemical is sold, or unwanted mixtures occur. Additionally, because of these

observations, it is imperative that Norsk Hydro be absolutely sure that herbicides are **never** stored in the fertilizer warehouses and that herbicide (and other pesticide) residues are absent.

Because all of the warehouses in the project are of Soviet vintage, whether the 5 core facilities, or the others, it is likely that contamination of the environment occurred from all of these facilities in the past. Evidence of this is the report of two major spills of anhydrous ammonium which occurred at two core warehouses in the past which created significant health and welfare problems. At one site, 400 cubic meters of anhydrous ammonium poured onto the ground flowing into a river about 1 kilometer distance and the cloud of gas passed through the adjacent village. Several people were severely injured and there may have been mortalities. At the other site, an unknown amount of anhydrous ammonium spilled during loading operations at another 400 cubic meter tank and the cloud made people sick and destroyed crops, orchards and home gardens. It is therefore necessary to know what the current level of water quality is in the immediate vicinity of the warehouses, since the two aforementioned events probably contaminated the water supply. It is also necessary to begin a periodic water quality monitoring program in those warehouses located in areas where domestic wells or surface waters are present.

A. Monitoring Requirements

1) **Water quality must be monitored** from wells and waterways in the immediate area (approximately 1 kilometer distance) of at least the three warehouses mentioned in Table 4 every six months for the presence of fertilizer residues. The two other core warehouses are of such distance from water sources as to not need this requirement (See section 6.2). If Norsk Hydro decides to use other warehouses close to domestic water sources and surface waters, water monitoring should also occur semiannually. Pesticide monitoring would be desirable as well, since pesticides are stored at many of the complexes, but it is not considered to be the legal responsibility of Norsk Hydro to perform these analyses. Water from the wells in the vicinity of chemical warehouses and at key locations on the farms in the project used to be tested periodically by the Ukrainian government, but we observed laboratory errors in labeling that do not provide adequate information as to water quality at all sites. Such testing should be conducted as soon as possible to establish a baseline data on existing levels of acidity, sulfates, chlorides, nitrates and phosphates. Groundwater should be monitored through boreholes at least once a year to detect any possible leaching of fertilizers. This is already required by law for pesticides. Samples from these bore holes should be analyzed to identify point source leakage if present.

2) Monitoring of progress made in complying with the mitigations described in the EA and improving the situation at all warehouses must be done on a quarterly basis. Norsk Hydro is required to periodically describe their needs and the needs of the partners based on their own analysis of each warehouse site. The CNFA Environmental Officer will verify compliance through periodic inspections on site, reading the company's quarterly reports and reporting to USAID quarterly as to progress. Thus, adjustments in mitigations can be made as the project progresses.

B. USAID Guidelines for Chemical Warehouse Management

The following Tables are specifically for pesticide storage and use but can be used in general for fertilizer storage and use.

Table 1: USAID Recommendations for Pesticide Storage

1. Be located in an area far away from dwellings and surface water and not subject to flooding or shallow water tables.
2. Be shaded if possible to help regulate temperature in the warehouse.
3. Be fenced, locked, and posted with warning signs.
4. Be built of nonflammable materials.
5. Have floors of smooth concrete or other impervious material, so that pesticides will not be absorbed.
6. Be well ventilated, to avoid buildup of heat and fumes.
7. Be surrounded by containment structures (ditches, berms, etc.) to prevent spills from flowing off-site.
8. Be well lit.
9. Have posted spill management instructions, spill containment and safety supplies (e.g., shovels, sand, brooms, hoses, fire extinguishers), and a water source for spill decontamination.
10. Use a ?first in, first out? procedure is followed.
11. Store individual chemicals separately, and on wooden pallets.
12. Maintain aisles so that all chemicals are accessible.
13. Prohibit the storage or consumption of food, tobacco, or drinking water in the warehouse.
14. Make a supply of soap and water for washing available in the warehouse.

Source: USAID 1991

Table 2. USAID Recommendations for Pesticide Application

1. The label should be written in the local language.
2. The applicator should follow the directions on the label, including the use of protective clothing and respirator.
3. Never leave pesticides unattended in an unsecured place.
4. Never transfer pesticides to containers other than those designed to hold that pesticide.
5. Never work alone with pesticides.
6. Inspect containers for leaks before moving.
7. Keep food, drink, tobacco, and eating utensils away from the work area.
8. Never eat, drink, smoke, or rub your eyes when handling pesticides.
9. Always have soap and plenty of water available at the work site.
10. Thoroughly wash protective clothing after handling pesticides, separate from other clothing.
11. Dispose of any heavily contaminated clothing.
12. Workers should immediately stop work and wash if pesticide spills on them.
13. Keep unauthorized persons, especially children, away from pesticides.

Source: USAID 1991

C. General Mitigations Applied to all AP -II Agrochemical Warehouses

1) The warehouse in Kolomya should be included in the watermonitoring probgram is NH uses the facility. Although NH does not own majority shares consideration is being made whether to buy the controlling block of shares. This warehouse is situated 200 m from a village, disallowing the site automatically according to Ukrainian law. There is no storm and snow runoff collection pond at Kolomya. According to the Director of the facility, the water table level is high, the climate is rainy and the wells in the village are already polluted with nitrates.

2) Leaky asbestos roofing in the warehouses must be repaired in a way that protects the workers from asbestos poisoning and all asbestos that is removed must be disposed of in accordance with the safety measures.

3) The water table depth and infiltration rate must be determined for warehouses that do not have proper snow & storm runoff receiving ditches or ponds. If the water table level is higher than 30 meters, impermeable receiving ponds must be constructed.

4) A main focus of the training courses taught by NH to the farmers will be to provide

information concerning the proper use of agrochemicals, emphasizing the consequences of mismanagement and the need to conduct all farming activities in environmentally correct manner. Integrated Pest Management (IPM) must be included in the curriculum.

5) During technical assistance to the farmers, NH must provide information concerning the proper use of fertilizers, with emphasis on the correct storage and disposal of containers.

6) Training warehouse personnel how to clean up spills exterior to the warehouse and proper disposal of spillage is required. This can be accomplished in house by NH as a normal part of their existing worker safety program.

7) Wall separators between the different kinds of fertilizers are good mitigations for protecting the quality of the product.

8) Caution is needed to avoid radioactive contamination by fertilizer from Belarus and parts of Ukraine and Russia. If potassium and phosphorus are imported into Ukraine from known contaminated areas they must be analyzed for the presence of radionuclides.

9) The soil testing laboratory will be required to present a chemical and waste management plan and evidence of compliance during the project. Water analysis for fertilizer and pesticide content may be required at any or all of the demonstration plots.

10) An Emergency Preparedness Plan is required. A plan should be made for run off catchment and disposal after accidental releases or spills of pesticides and fertilizers. Some of the warehouses currently have adequate ditching around the warehouses. Standardized data sheets should be supplied to the fire fighting personnel and every buyer or user of chemicals as well as medical providers. The Emergency Preparedness Plan should also include an account of the specific conditions which will be required to successfully extinguish a fire event with a chemical fuel base. This must include a description of the local emergency response teams time to the company**?**s site, as well as the measures that will be taken to ensure than no contamination of the area**?**s prime drinking water facility can take place.

11) All the roads and patios surrounding the warehouses must be repaired, asphalted or cemented.

If at any time, pesticides are stored and sold through the warehouses by NH or its partners, the following mitigations apply:

12) Elaboration of a Pesticide Container Management Plan must be completed. Empty and improperly discarded pesticide containers represent a significant and present danger to the environment and human health. Empty pesticide containers are so popular for

recycling as containers for various substances in Ukraine, including food, that they have become targets of theft from organized crime. Empty pesticide containers are notorious sources for poisonings, especially among children and alcoholics. This real problem must be resolved. It is the obligation of the seller of the pesticides, e.g. Norsk Hydro and their distributors, to formulate a management plan to reduce the risk of accidental poisonings. The current NH training concerning safe pesticide management must include instructions on the proper disposal of the containers. Norsk Hydro should verify their success in training by interviewing farmers about how they are actually progressing with proper container disposal after every harvest cycle. Correct disposal techniques of pesticide packaging is a mitigation for the use of pesticides.

13) As long as the project supplies, uses or recommends the use of pesticides, all of its pest and pesticide management activities must remain under the supervision of a qualified individual. All pesticides that leave the warehouse should have Russian and/or Ukrainian language brochures specific to the product, or all containers should have translated labels on them.

14) Resale of unused pesticides must be prevented. .

D. Specific Site Mitigations

Because HAU owns 50.5 percent or more shares in five warehouses: Bershad, Lubny, Smila, Uman and Lokhvitsa, they will be responsible for compliance with the environmental mitigations. HAU must report in their quarterly report about their efforts to comply with the environmental mitigations as listed in this Environmental Assessment. Although HAU owns only 40% of the warehouse in Kolomya, due to the substandard conditions a baseline study will perhaps be required if there is continued use of this warehouse..

2) PURPOSE

The Ukrainian output supply of mineral fertilizers is outdated by as much as 50 years and is incapable of meeting the needs of modern agriculture. Norsk Hydro intends to respond to these needs by introducing state-of-the-art agrochemicals, in particular fertilizers. However, a modern Farm Supply Center in Ukraine cannot be operated successfully without an appropriate service network. An adequate consultancy and training program must be an integral part of the Farm Supply Centers.

The purpose of the project is to create five integrated agricultural Farm Supply Centers that will provide farmers with not only fertilizers, but other agrochemicals (plant protection chemicals, seeds,) and to some extent, new equipment. HAU will introduce the best western standards of quality, application, storage, transportation and availability and correct environmental practices. The core activities include: 1) providing the necessary fertilizers,
2) handling fertilizers at the chosen warehouses, 3) financing inventory, 4) storage of fertilizers in

a safe way, 5) transportation of fertilizers and chemicals to local farms, 6) local marketing of fertilizers, and 7) a bagging operation. The core business cannot be successfully realized in Ukraine without comprehensive advising and training on all the aspects of the use of fertilizers and other agrochemicals. In Ukraine, training must have priority before marketing due to lack of knowledge and experience. The development activity in this project is designed to address this situation and to provide the above services to cover the following areas:

1) two agronomists will be hired for the purpose of advising at the farm the use of fertilizers;

2) holding agronomy seminars for local farmers to review their situation more comprehensively;

3) overseas training for dealership staff to bring them up to par with western staffs

4) organizing of field tests close to each dealership.

As a result, the farmers will be provided an opportunity to obtain high quality inputs, production advice and, importantly, access to markets for their products.

3) DESCRIPTION of PROJECT

This project will upgrade five fertilizer dealerships into units capable of supplying sufficient volumes of fertilizers and a limited amount of other agricultural inputs (plant protection chemicals, seeds and to some extent, new equipment) to local farmers. The plan is to increase the total volumes of fertilizers from 5,000 MT in 1996 to 25-35,000 MT in 1999. This expansion presupposes an increase from six to ten active Ukrainian dealers in 2000. Raising the standards of handling, storage, transportation, availability and correct environmental actions is of utmost importance. There will be field tests consisting of 500 ha per dealership for testing of different field crops simultaneously with inputs of fertilizers, plant protection chemicals, seeds and new equipment. HydroAgri, working with the dealerships, will advise farmers on the use of fertilizers, including soil analysis and ways to economize the use of fertilizers and to insure environmentally correct usage. Nitrogen will be derived locally from Ukraine. Potash and phosphorus will most likely need to be imported. The Farm Service Centers will not only supply and store fertilizers, but also chemicals and seeds.

4) ALTERNATIVES INCLUDING THE PROPOSED ACTION

4.1 No Action Alternative

Ukrainian agriculture is in crisis. Inefficient due to its nature, the collective farm system has fallen apart and is unable to supply much needed fertilizers and agrochemicals. The government subsidies that supported the system at one time are not now available. According to the Ministry of

Agri Industrial Complex (AIC), from 1988 to 1996 fertilizer use decreased by 91%. Outdated agricultural technology and lack of modern information and knowledge exacerbate the situation. Ukrainian soils suffer from lack of fertilizers (fertilizers have not been applied on the farms for several years) and crops cannot stand the competition of weeds without pesticides (Appendix D). If the situation has not improved within the next few years famine is reasonably predictable, with strong indications of malnourishment on collective villages already apparent.

Private farmers have no access to credit, agrochemicals and services and no experience in marketing. Consequently, the chance of survival is minimal under current conditions. The status quo of ?No Action? is not acceptable.

4.2 Proposed Alternative

The Hydro Agri Ukraine Farm Supply Center project as proposed will contribute to the revitalization of farming and will result in positive environmental impacts because:

1) fertilizers combined with advice on their use and correct timing of application will prevent further nutrient starvation of the crops, increasing crop yields;

2) reasonable application of agrochemicals will create new possibilities for farmers to access the best agricultural environmentally sound practices and raise the nutritional value of crops;

3) maintenance of modern machinery will retard excess fuel consumption.

It is a mute point within the context of the AP-2 Project to argue whether the choices of a particular corporation to carry out its business plans are valid or not. The objective of AP-2 is to help facilitate the establishment of capitalist enterprises in Ukraine and Moldova. It must be left to each AP-2 contractor to decide through its own marketing surveys and perceived abilities in a highly volatile economic situation, whether or not to chose to commence business activities in Ukraine. In the case of Norsk Hydro, the company negotiated with twelve Agrochims about storing their mineral fertilizers and chose the five best facilities to operate from as majority share holder. These warehouses were inspected as to adequacy and remodeling is planned. That ***fait et complet*** within the context of AP-2necessitates the CNFA environmental office to provide environmental advice and consultation about remodeling and monitoring so that the current environmental situation at the warehouses can be understood, and mitigations will be provided with which to reduce or eliminate environmental hazards due to the project.

Therefore, within the context that some new paradigm is drastically and immediately needed to turn Ukrainian agriculture towards new and profitable mores, the project as proposed is desirable, and the mitigation package described in this document will be applied with monitoring of progress based on periodic field inspections by CNFA personnel and as reported in HydroAgri quarterly reports.

5) AFFECTED ENVIRONMENT

5.1 Description of the Environment

The dealerships are located in 4 Central Oblast of Ukraine: Kyiv (Baryshivka), Poltava (Lubny), Cherkassy (Uman and Smila), and Vinnytsya (Bershad). This is the most heavily populated primary agricultural zone of the country. Only Baryshivka, in Kyiv Oblast is located close to the now idle industrial area of metallurgical foundries and metal smelters.

After the collapse of the Soviet Union, fertilizer use has decreased significantly (Graphs 1 and 2). Total tonnage for active ingredients of nitrogen (N), phosphorus (P) and potassium (K) fertilizers has been reduced from 3,804,300 metric tons in 1991 to 419,800 metric in 1996 (Source: Ukrainian Ministry of AIC, Ukrainian Ministry for Foreign Relations). As the livestock capita has decreased, so has the application of organic fertilizers. Organic fertilizer use has fallen from 15 tons per ha to 3-5 tons average. This represents a potential agricultural disaster of an immense degree.

Short and long term implications to a sustainable society and environment are apparent with such a scarcity of fertilizers in agriculture. The discontinued use of mineral nitrogen fertilizers depletes nitrogen from the soil and causes imbalances in NPK ratios causing a condition of too much phosphorus and potassium. Mineral malnutrition drastically affects plant metabolism on a grand scale. Soil structure can change rapidly, creating a farming situation that will be progressively more difficult to correct as long as nitrogen extraction continues in wheat lands, sunflower fields and sugar beet areas. Reduced yields have the strong potential to cause famine which has repeatedly occurred in Ukraine.

5.1.1 Physical Environment

The dealerships are located in the middle of Ukraine. It is a typical rural area devoted to field cropping, animal husbandry and some forest plantations . According to the Ukrainian standards, the warehouses for fertilizers must be located at least 4 km from the residential parts of towns or villages. There were exclusions from the rule. The towns and the adjacent villages are grouped in typical Soviet style and the dwellers are used to have their own vegetable gardens. The climate is typical north temperate, with July highs of $+38^{o}$ C and January lows of -35^{o} C.

5.1.2 Biological Environment

All the locations are primarily agricultural regions within the forested steppe zone that is naturally forested by coniferous species interspersed with broad-leaved associations of beech, linden, maple, and ash. Soils are diverse, usually forest grays or chernozems. Bird species observed were the grey European crow and another species of black crow (rook), magpies, English sparrows, rock pigeons, and northern chickadees. Partridges, jays and white storks are reported to inhabit nearby woods and marshes. There are various raptors and song birds. There is

reported to be extensive avifauna and fauna in the deciduous forested remnants, which have species such as chestnuts, oaks, hornbeam, birch, some spruce and Scotch pine. Almost all of the land has all been cleared off for agriculture. Some tree plantations serve as wind screens, snow fences and firewood primarily of various oak species are present. These borders are usually 1-2 rows of trees wide. Woodland lilies, ferns and others may be present, and an occasional Red Russian Code species may be present. Common cultivated plants include the Lombardy and other poplars, weeping willows, oaks, maples, basswood, hornbeams, buckeye, elms, beech, some conifers such as black spruce and blue spruce, lilacs, roses, bridal veil, etc. The list of rare and endangered species cannot be prepared because of dispersed locations of the facilities.

6) LAND and WATER ISSUES RELATED to the USE of FERTILIZERS

Ukrainian official estimates of the optimum applications of Nitrogen , P2O5 and K20 are 180 kg per hectare average. The World Bank points out that this amount of fertilizer is for optimal predetermined production goals and not necessarily for monetary profits. The World Bank does not describe what ratio of NPK mineral fertilizers are recommended in the 180 kg/ha application rate.

Since the collapse of the Soviet Union, Norsk Hydro has used only Ukrainian sources of fertilizers produced at the largest Ukrainian chemical factories: N containing fertilizers at Cherkassy?s ?Azot?, Phosphorus fertilizers at Vinnitsia and Sumy and Potassium compounds at Kalush (Ivano-Frankivs?k) and Novy Rozdol in L?viv Oblast. Phosphorus-containing raw materials are delivered from the Russian ?Apatity?, which is close to ?Novaya Zemlya?, the territory exposed to nuclear weapons testings.

The correct balances of fertilizer are critical for productive agriculture. The discontinuation of adequate nitrogen fertilizer additions to the soil, as has happened in Ukraine since 1991, creates structural changes of the soil which may be permanently deleterious to soil fertility and production potentials. Relying on the commonly used seven-year rotation scheme that does not include legumes results in mineral and organic nutrient mining of the soil. The most widespread rotation practice over most of the Ukraine is: fallow - hard winter wheat - corn - barley - fodder corn - hard winter wheat and last, sunflowers. The lack of a nitrogen-fixing legume such as alfalfa (lucerne), clovers or soybeans results in a significant depletion of nitrogen from the soil. Even one fallow period cannot make up for the depletion; two fallow years would be much better. When the rotation includes fallow and conversion to weeds, their root systems extract nutrients from various depths and different soil partitions. The roots then translocate the nutrients into the foliage and floral parts. Upon completion of the annual life cycle, many minerals have been recycled to the surface and soil fertility is at least partially renewed. Then, with a light tilling, or minimal tillage practices, the organic matter from the previous year fallow plants gets converted into the top layer humus of the soil where next year?s crops can benefit from additional mineral nutrition. The organic material also produces organic acids which help decompose parent rock materials releasing more nutrients. Without frequent fallow periods in the absence of addition of mineral or organic fertilizers, soils can become depleted of nutrients, even with the inclusion of legumes and other nitrogen fixing crops in the rotation scheme. In alfalfa, for example, the leaf and stem tissue

is harvested and removed with its mineral content, even though its deep root system brings up minerals from the lower soil horizons to the top layer. But since nitrogen fixation occurs in root nodules and since the roots remain in the soil, much of the nitrogen remains in the soil even though the foliage is harvested.

Correct replacement of plant-extracted nutrients results in sustainable agriculture soil mass equations which must include mineral losses through erosion, evaporation and soil solution gravitation effects. Without replacement, soils become exhausted of their mineral resource, and agriculture fails. In rape seed production, for example, yields of 4,032 kg/ha remove about 134 kg/ha of nitrogen, 56kg/ha of phosphorus (P2O5), and more than 67 kg/ha of potassium (K2O) each year (Chapman and Carter, 1976). Fertilizer recommendations to maintain proper nutrient ratios depend on the results of soil tests. Application of nitrogen fertilizer is recommended for soils with less than 95 kg/ha. Potassium may be required on sandy soils at rates of 34-67 kg/ha. Sulphur may also be required (Chapman and Carter, 1976).

6.1 Various Recommendations for Optimum Crop Yields

A. Montana - Depending on macronutrient blends, spring wheat in Montana varied greatly in response to different amounts and combinations of fertilizers. Control plots yielded 29 bushels per acre = about 1300 kg/ha and optimal production with fertilizers was 57 bu/ac = about 2590 kg/ha. (Chapman and Carter, 1976). The following chart recommends proper application rates.

Table 3: Recommended Application Rates of Mineral Fertilizers Supplied to Crops in Ukraine (nutrient, kg/ha)

				Zone,	Sub-Zone		
Crop	N-P-K	Forest	Porest-Steppe-Westem	Forest-Steppe-Central & Left Bank	Steppe-North and Northwest	Steppe-Central and East	Steppe-South, SW, Crimea
Winter Wheat	N	80-100	90 -120	60-100	60-80	60-80	40-60
	P_2O_5	60-80	60-90	50-80	60-70	40-60	40-50
	K_2O	60-80	60-90	60-90	40-60	20-30	?
Barley	N	60-90	60-90	45-60	45-60	45-60	40-50
	P_2O_5	45 -60	60-90	30-45	30-45	30-45	40-50
	K_2O	45 -60	60-90	30-45	30-45	30-45	?
Oats	N	45 -60	45 -60	40-50	40-50	30-40	30-60
	P_2O_5	30-50	40-50	30-40	30-40	30-40	30-40
	K_2O	45 -60	50-60	30-40	30-40	20-30	?
Grain Corn	N	90 -150	80 -120	60-90	60-90	60-90	40-60
	P_2O_5	60-80	80-90	80-90	50-60	60	40-60
	K_2O	60-90	60-90	60	50-60	30-45	__
Sugar Beet	__	180	130	100?	?	__	
	P_2O_5	?	150	120	80?	?	__
	K_2O	__	200	160	120?	?	__
Potato	N	80-90	80-100	?	?	?	__
	P_2O_5	80-90	60-80	?	?	?	__
	K_2O	100 -120	60-90	?	?	?	__

Source: Dehodiuk, E. H? "Production of Ecologically Safe Products," Kiev,

B. Ukraine - E.G. Degoduk and O. T. Predko in Ukraine (Saiko, 1994) calculated the effects of fertilization on cereals, corn, groat and pulse crops in three regions under three climatic

regions. The results of 1 kilogram per hectare applications of active substance of mineral fertilizers were, using winter wheat as an example, an increase of 3.2 - 4.7 kilograms yield. Degoduck and Predko stated that on the average ?1kg of full mineral fertilizer provides increase of yield by 4.5 kg?. Recommended fertilization rates were not mentioned. During good years the average yields of wheat ranged from 500-600 kg/ha. Yields fluctuated from between 3-4 tons per hectare during adverse years. Corn ranged from 6-7 t/ha in good years and 4-5 t/ha during unfavorable years. Above all else, the fertilizers appeared to stabilize yields in different climates, with about a 25% increase in yield using fertilizers in the bad years.

The Ukrainian Main Statistics Department reported the 1996 yield of grain in Ukraine for all Oblasts ranged between 1.47 and 3.12 tons/ha. These yields were from 0.5 and 10.6 percent lower than 1995 yields due to the ?severe weather conditions.?

7) LAND and WATER ISSUES RELATED to the STORAGE of FERTILIZERS and PESTICIDES

Improper fertilizer management and storage can result in environmental contamination and worker accidents. A particular problem is contamination of ground water should excessive spills of fertilizers occur and are not correctly cleaned up. Norsh Hydro is to ensure that safe conditions exist for groundwater protection with correct warehouse management. A correct warehouse management plan that is followed will lower the environmental risk to ?low to moderate risk? category.

The consequences of fires at chemical warehouses pose a particular threat to the local water uptake system, as runoff from water used to extinguish the fire could transport chemicals into the water table. This concern should be covered by the Emergency Preparedness Plans of each individual warehouse. Entrapment canals without exits need to be constructed to prevent the run off of spills from warehouse activity over the years. Preferably these canals should be lined with impervious materials. Emergency spill traps should be installed.

8) IMPACT of WASTE DISPOSAL

The mitigations listed for fertilizers and pesticides in Section 1 will aid in preventing pollution problems. Disposal of torn or discarded bags will be through the municipal waste system which appears to be adequate in most places in the country. This kind of waste should be minimal.

9) AIR EMISSION and NOISE LEVELS

A. Air Quality

In areas where chemicals are stored and handled, the potential for spills and leaks that rapidly deteriorate air quality in a closed environment must be addressed. The ventilation system

in the warehouse must meet US standards for worker protection. Odors of pesticides were apparent in all the warehouses visited and is severe in several of them. Due to their isolation, the warehouses pose no threat to air quality during normal operations.

B. Air Emissions

Air emissions will also occur from combustion products emanating from truck and automobile traffic, skip loader activity within the warehouse and around the property and train traffic bringing the bulk fertilizers to the warehouses. Some dust will be created during loading and unloading operations in the warehouse by fertilizers. The patio areas are made of cement or asphalt and therefore dust will be minimal. The arterial highways going past thewarehouse facilities are generally all weather surfaced. The plants are often located ina rural areas in light industrial zones adjacent to railroads. Air circulation is sufficient to completely and rapidly disperse air pollutants. A problem is not foreseeable from air pollution. If Norsk Hydro becomes involved in anhydrous ammonium storage and handling, special air pollution prevention plans will be necessary.

C. Noise

The noise from the normal day to day work is not considered to be excessive.

10) POTENTIAL IMPACTS of TRANSPORTATION

No negative impacts to transportation are foreseen with this project due mainly to the rural setting of the facilities. The hard surfaced roads leading to the warehouses are not heavily traveled, but some of them are in bad shape.

11) EFFECTS of FACILITY DEVELOPMENT on AESTHETICS and VISUAL QUALITY

The warehouses are not generally visible from the villages or towns. . The location of the warehouses corresponds to the ex-Soviet standards and are located outside the villages or in industrial zones. Aesthetics were not a part of the soviet design of any of the facilities, and generally they are not beautiful to look at, but many times are surrounded by extensive industrial zone of equal or greater ugliness.

12) PUBLIC HEALTH and SAFETY

Public safety and health are of vital importance in regards to possible contamination of ground water due to the spillage of chemicals. Correct storage and use of fertilizers and pesticides is also a top priority. These should both be covered under the Emergency Preparedness Plan. Security at the warehouses currently includes a night guard and/or high fences surrounding the site.

13) EMERGENCY RESPONSE SERVICES

There are emergency services in the village hospitals and clinics. The facilities also have an emergency response workers plan. Generally, the warehouse facilities have arrangements with local fire departments for fire prevention and control. The contaminated wells at nearby houses at several sites is a matter of further discussion and consultation.

14) ENVIRONMENTAL CONSEQUENCES

In a fertilizer-starved environment, rapidly falling crop production and a collapsing economy, correct applications of the fertilizers that Norsk Hydro will be distributing will have an overall positive effect on the environment. Increased yields will provide much needed food and capital for the country. Farmers will then have options for better land husbandry, and investments in conservation practices, such as minimum till agriculture. Increased crop yields due to correct applications of fertilizers will help pay balance of payments, increase capital and the standard of living for the entire country. By following correct warehouse management procedures, Norsh Hydro and their cooperators will improve the environmental situation at the sites by preventing spills and cleaning up immediately when spils occur.

USAID?s policies on pesticides provide a framework within which to assess the status of agricultural chemical management in Ukraine. USAID?s pesticide policies are summarized in the following excerpt from *AID Policy Paper: Environment and Natural Resources (1988):* ?Also essential to environmentally sound and sustainable agriculture is the proper application, storage, and disposal of agricultural chemicals. A.I.D. policy is to support more natural pest control efforts through integrated pest management efforts to: a) reduce the use of chemical pesticides to the fullest extent practicable; b) use only those pesticides which are safest to the environment and people; c) discourage general requests for pesticides, and assure that pesticides are used with natural control programs; d) develop infrastructures in developing countries for all aspects of proper pest and pesticide management, including regulation of manufacturing, labeling, distribution, work and public exposure levels, application, storage, and disposal; e) communicate U.S. policies and experience on pest control and pesticide problems to other nations and international organization; and f) promote the use of supplementary or alternative methods of vector control which are not dependent on the use of toxic chemicals.?

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16) APPENDIX

A. Initial Environmental Evaluation
B. Maps of Region
C. Photograph Album
D. Fertilizer Statistics for Ukraine, 1991-1997
E. Warehouse inspections for remodeling needs