US — China Mission Notes for 21 April — 8 May 2001

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SUMMARY OF ISSUES AND CONCLUSIONS BETWEEN U.S. DELEGATION AND THE NATIONAL NATURAL SCIENCE FOUNDATION OF CHINA (NNSFC) AND MINISTRY OF AGRICULTURE (MOA), 8 MAY 2001, BEIJING, P.R.C.

As per Executive Vice President Li Jing s suggested framework for these discussions:

1. We gave our impressions of the serious erosion, deposition and sedimentation**,** and environmental protection problems of all types that are occurring on the Loess Plateau and the necessity of addressing them through an integrated program of research and development.
2. We provided technical recommendations and suggested that increased funding would be needed to address the outstanding problems.
3. The U.S. participants on this mission saw many successes as well as problems and are prepared to launch collaboration in those areas of science where mutual benefits appear attainable through a collaborative program.
4. A portion of our discussion was allocated to developing scientific exchange by all participating agencies to promote (a) joint research in terms of Ph.D. programs, post-doc programs, sabbatical visits, and collaborative research; and (b) education, extension**,** and demonstrations to assure a technology transfer of knowledge that can be applied by farmers and land managers.
5. We confirmed establishment of an Organizational Committee composed of three members each from the U.S. and China. Further, the U.S. Department of Agriculture (USDA) agencies — the Agricultural Research Service (ARS) and the Natural Resources Conservation Service (NRCS), and the U.S. Geological Survey (USGS) are proceeding with concrete steps to plan a U.S. and Northwest Sci-Tech University of Agriculture and Forestry (NWSTUAF) Joint Center.
6. Vice-President Zhu Zuoyan from the National Natural Science Foundation of China expressed willingness to encourage the development of this initiative with a strong indication of financial support.
7. Vice-Minister Zhang Baowen from the Ministry of Agriculture also supported the concept of a joint center and provided in-depth notes on Chinese agricultural policy that substantiated his views (Appendix 1).

SINO-U.S. PROGRAM ON SOIL AND WATER CONSERVATION & ENVIRONMENTAL PROTECTION IN NORTHWEST CHINA

May 1, 2001

Discussions of future cooperation and proposals: Northwest Sci-Tech University of Agriculture and Forestry (NWSTUAF) in the Guest House at Xinong Campus. Chairpersons: Executive Vice President Li Jing (NWSTUAF) and L. Douglas James (NSF).

Discussions focused on specific issues of understanding prerequisite to the consideration of a U.S.-China Center for Soil and Water Conservation and Environmental Protection in northwest China. Chinese and American participants presented views on the kind of center that would be required to attract and maintain ongoing support for the anticipated work. The Chinese delegation preferred a physical entity based at NWSTUAF, which might at first be an office where existing charter projects could be coalesced into a critical mass of effort to give the Center form and substance. This office would also assume responsibility for coordination of exchanges, communications, and visits. The U.S. side requires time to determine which university and government agencies could participate, but visualizes the establishment of a virtual center at a U.S. university that could provide a coordinating base for the U.S. team. An initially small effort would progressively expand, preferably with sufficient flexibility to evolve its topics of study and institutional composition.

Issues centered on the need to define (1) the scope of science and technology interaction, and (2) the logistical framework to organize the Center. The group decided to break into two groups to address the above issues. Drs. Scott Christiansen and Zhang Shuoxin summarized the results of the institutional subgroup while Drs. Waite Osterkamp and Liu Guobin compiled those topics and issues identified as priorities by the technical group.

Institutional and logistical framework to establish a joint Center

The group agreed that a 6-person (3 U.S. and 3 Chinese) Organizing Committee (OC) be established as soon as possible. Within the first 30 days the OC would write Terms of Reference (TOR) describing the scope of its work and it is anticipated that its task would last for a period of 6-12 months. The participating agencies nominated Scott Christiansen (ARS), representing USDA; John Gray (USGS), representing the Department of Interior; and William Sprigg (University of Arizona), representing the university community. The Chinese side nominated Wei Yimin, Zhang Shouxin, and Liu Guobin. Shou-shan Fan would continue as Facilitator.

The OC members are to report to their respective agencies or institutions to clear their responses in advance of any written commitments documented by the OC. The TORs for the OC would (a) determine the participating agencies and institutions (charter plus other interested parties) and describe how they organize themselves, (b) outline how the U.S. and China sides coordinate with each other; (c) formulate mechanisms to manage exchanges of visiting scientists; (d) provide an agreed scope of technical work; (e) assemble a technical review process for joint work; (f) identify charter projects that could show immediate activity for the emerging Center; (g) formulate procedures to introduce new projects; (h) define financial arrangements and commitments; and (i) provide for administrative oversight.

Each side would fund the activities of its members of the OC. The two sides will meet separately three to four times to discuss a pre-announced set of agenda items, recording the minutes of each meeting so as to be shared bilaterally. It is anticipated that following the last meeting it will be necessary for the U.S. and China members of the OC to meet as a full committee. One or two physical meetings are envisaged over a year s time —with the next meeting to take place in the U.S. Depending on the degree of accomplishment towards the goal of opening the Center, the responsible administrators from each party will decide, by November 30, 2001, whether to plan a more detailed workshop. A Memorandum of Understanding could then be prepared for signature at this subsequent workshop to outline formally the work plans for the Center.

Technical considerations for the work of a joint Center

Once the Center is set up, researchers will focus on soil and water conservation and environmental protection activities. In the Yellow River Basin, including the Loess Plateau area, the conservation of soil and water in one place may have adverse effects elsewhere. Thus, we propose to re-define the conservation concept as that of integrated soil and water management throughout the Yellow River Basin, and that management approaches to the thoughtful distribution of water be at scales ranging from small fields to the entire basin. Furthermore, soil erosion must be considered at various scales, recognizing that river flow, wind, rain and human disturbance each play a role. Some sediment is eroded from surfaces of terraces, construction sites and from overgrazed pasture; however, most of the soil movement comes from steep slope farming and gullies, escarpments between terraces and stream banks. Special concern for these sources of sediment, which represent small areal scales, needs to be given to this aspect of soil and water management if basin-scale problems of sediment transport are to be addressed.

Accomplishment of the goals for soil and water management and environmental protection should be conducted acknowledging the importance of

1. rational utilization and integrated management of water resources;
2. transport of pollutants (sediment, pesticides, nutrients, etc);
3. modeling of environmental rehabilitation and soil conservation in medium-sized watersheds;
4. land use and land cover to meet environmental and economic requirements;
5. vegetation resources and restoration including new species, eco-system stability, and relevant techniques;
6. dryland agricultural techniques;
7. watershed ecosystem assessment including evaluation of (i) impacts of human activities, (ii) susceptibility to climate change, (iii) the driving forces of ecological change related to both restoration and degradation, and (iv) a watershed health index of appropriate indicators.

TECHNICAL COMMENTS AND RECOMMENDATIONS BY THE U.S. MISSION ON SOIL AND WATER CONSERVATION AND ENVIRONMENTAL PROTECTION IN NORTHWEST CHINA

Northwest Sci-Tech University of Agriculture and Forestry (NWSTUAF) Goals (as perceived by the U.S. mission)

1. Research and develop farming methods and land use management to:
    a. Reduce soil erosion and encourage sediment storage at desired sites;
    b. Recognize three principle processes of erosion:
        i. Water (upland to include rain splash impact, overland flow, rill and gully erosion, and ephemeral gully erosion; bottomland to include fluvial sediment transport, bank erosion and channel erosion),
        ii. Wind (deflation and deposition),
        iii. Gravity (mass movement and slope failure);
    c. Increase water use efficiency:
        i. Precipitation and runoff,
        ii. Applied water (irrigation);
    d. Increase soil quality:
        i. Increased fertility,
        ii. Reduced salt build-up,
        iii. Improved water holding capacity;
    e. Maintain or increase production:
        i. Subsistence,
        ii. Net income;
    f. Decrease other pollutants in streamflow, especially nutrients and applied chemicals, recognizing the pollutant delivery process, which includes:
        i. Availability, sediment detachment from the river bottom, transport, deposition and storage, and integration into receiving waters; and
    g. Improve air quality through reduction of wind blown dust.

2. Encourage or require farmers to adopt new research-based farming approaches, when available, such as establishment of buffer strips, stiff grass hedges, and development of high flow by-pass channels from tributary basins or watersheds.

3. Demonstrate to funding agencies the importance of research and application of results to maintain and/or increase future funding and expand research and education programs.

I. Field-Scale Issues: NWSTUAF has concentrated most of its efforts on plot research on upland source areas. These results are the critical building blocks to demonstrate fundamental aspects of soil and water conservation technologies. However, in a large scale, systems context, it is possible that the conservation of soil and water in the upper basin of the Yellow River may cause adverse effects in the lower basin. Thus, we propose to re-define the conservation concept for study as that of integrated soil and water management and environmental protection throughout the Yellow River Basin. Management approaches to the thoughtful distribution of water should be at scales ranging from small fields to the entire basin. Furthermore, erosion must similarly be considered at various scales. Some sediment is eroded from surfaces of terraces, construction sites and from overgrazed pasture; however, most of the soil movement comes from steep slope farming and gullies, escarpments between terraces and stream banks. Special concern for these sources of sediment, which represent small areal scales, needs to be given to this aspect of soil and water management if basin-scale problems of sediment transport are to be addressed. Sites of sediment storage, perhaps mainly along trunk streams of medium-sized basins in the lower reaches of the Yellow River, should also be identified. Because these concerns extend over time-scales where climate variability is an issue, climatic baselines, monitoring changes, and assessing the implications of climate variability should also be considered.

Recommendation I-a: Develop, through research, appropriate and reliable characterization, assessment, and predictive tools for:

1. Soil erosion — include Chinese data for the improvement of the Revised Universal Soil Loss Equation (RUSLE) for use on the Loess Plateau and develop a program designed to collect supplementary information where needed. Especially important should be the redefinition of the slope-length factor and rainfall relationships in RUSLE for Loess Plateau conditions;
2. Nutrient loss — develop a rating system and process model for nutrient application, plant utilization, loss in surface runoff, and deep percolation to ground water;
3. Research effects of different land use practices or combinations of practices on soil loss — some of this work is on-going; however there is a need for integrated research on the effects of water, wind and gravity erosion processes;
4. Establishment of land surface protection, especially vegetative, throughout the year —important examples are the many fields left totally exposed to wind erosion during the dry periods of each year; and
5. Integrating the effects of climate variability into the points above.

Recommendation I-b: Capitalize on available GIS databases and continue with watershed modeling. To demonstrate the impact of adoption of new conservation practices, an automated, process-based, robust, and repeatable model should be developed for use in watersheds in the Loess Plateau. With such a model or models, alternative plans of land use and treatment can be tested. Results can be used to decide where to allocate resources, as well as to predict effects and loadings to receiving streams. As a starting point, it is suggested that presently available models (such as the AGNPS2000 suite), that are scientifically defensible and subject to peer review, be considered.

Recommendation I-c: We also suggest a second modeling effort. Specifically, we recommend the development of a predictive model to anticipate how, during the next few decades, altered farming practices, urban construction, increased water use, and possible climate changes will affect streamflows and sediment delivery, storage, and deposition throughout the course of the Yellow River. The modeling effort should be conducted in a manner consistent with recognized techniques of evaluating water and sediment budgets.

II. Watershed and basin-wide issues: Flow and sediment delivery processes of the upland erosion areas need to be linked to sediment yield downstream in the lower drainage basin of the Yellow River; hence, an appropriate basin model must be developed. Most runoff occurs from headwater areas whereas most sediment is contributed from the Loess Plateau to the middle reaches of the Yellow River. Because there appears to be a goal for reducing the sediment delivery by the Yellow River from 1.6 to 0.9 billion tons/year, it might be projected that (a) sediment reductions would simply reflect the upstream treatment measures for decreasing soil loss, and (b) it appears possible that water conservation practices in the Loess Plateau area are reducing streamflows in the lower Yellow River, thereby exacerbating sediment deposition. Both propositions need confirmation through research and use of a basin model. Further research is needed if the downstream sediment problem is intensified owing to reduced runoff to lower reaches of the Yellow River.

Recommendation II-a: Resolve the sediment and water budgets for the Yellow River and
selected tributaries based on existing data, and refine as needed with newly collected data.

Recommendation II-b: Calibrate hydrologic models that will enable estimation of sediment and water budgets based on existing and hypothetical land uses and climatic conditions. Predict lower Yellow River channel evolution based on altered sediment and water inputs. The Modular Modeling System may represent an appropriate starting point for this effort.

III. Technological and socio-economic opportunities: Most farmers have shown that they can use fairly sophisticated methods, such as plastic mulch, with use of existing hand tools. Long hours are spent to assure maximum production of their crops.

Recommendation III — a: Use effective demonstrations of new practices, and promote these practices in the community. As a result, farmers may be amenable to making the necessary changes, improving their production, and protecting their lands.

Recommendation III — b: Socio-economic researchers should determine what motivates farmers to change their enterprises, beyond just increasing net income.

IV. Integration issues: A first issue is to develop a research approach, which recognizes that sediment delivery to streams is the result of erosion processes by water, wind, and gravity, and that these processes must be considered concurrently to understand and characterize sediment delivery to the Yellow River. A second issue is to integrate cultural and socio-economic considerations with the need for scientific approaches for soil and water conservation throughout the Yellow River Basin.

Recommendation IV— a: Watershed sediment budgets should be developed for selected drainage areas. Such a budget can be conceptual or quantitative, and it should identify all geographic sources of sediment from various erosion processes and should account for sediment storage and entrainment.

Recommendation IV — b: Also develop a sediment budget using a watershed model (as suggested above), to assess and analyze the magnitude of sediment from various sources, and to anticipate the effects of alternative land-cover, river-management treatments, and climate variability.

APPENDIX 1: NOTES ON CHINESE AGRICULTURE
VICE-MINISTER OF AGRICULTURE (MOA) ZHANG BAOWEN

The U.S. delegation met with Dr. Zhang Baowen, Vice-Minister of Agriculture Zhang Baowen and members his staff including: Dr. Li Zhengdong, Deputy Director General and Senior Economist, Department of International Cooperation and Dr. Wei Zhenglin, Coordinator, China - U.S. Scientific Cooperation Program, Department of International Cooperation.

China produced 300 million tons of grain in 1979 and 580 million tons in 1999. Population is increasing at 0.1 %, which equals 12 million people per year. Industrialization and urbanization have decreased arable land by 330,000 ha per year. In spite of the population increase and the loss of farmland, production of grain has risen with increases led by science and technology (new varieties and better quality).

Grain consumption is 400 kg/capita in China; therefore, the country must produce 640 million tons per year to feed a population of 1.6 billion in 2030. Increased production is needed and difficult to achieve. Issues include the structure of agricultural production and quality — costs are too high and quality is too low. Example: China has imported soybean since 1995. Soybean is native to China but the U.S. produces higher quality at less cost (22-23% oil for U.S. varieties vs. 18% for Chinese varieties).

Food security is the most important task for consideration by the MOA but due to geography and geology, resources are limiting and the Chinese are disadvantaged.

Agriculture development in China must consider four issues:

- How to strategically restructure agriculture in China?
- Ever since reform and the opening up of China, a policy of household production[1] was adopted; however the average scale is small. How can the industrial scale of production be improved?
- West China Development Campaign (WCDC) is a high priority because of the disparities between the development of the east and west. The government has committed human and financial resources.
- As China prepares for entry into the World Trade Organization they must be ready for the requirements to participate.

As for WCDC, 40 million hectares are available for farming north of the Wei River. Most of these lands are low yielding and a total of 3.6 million km^2 are affected by erosion (of a total 9.6 km^2 in China), i.e. 36% of the territory affected by erosion. Future objectives:

- Enhance research on soil erosion, dryland farming, plantation technologies and water saving techniques and extend these technologies to farmers.
- Control desertification by vegetating degraded lands with forests and grasslands. For this work the central government has programs to provide seeds, seedlings and financial incentives: (a) in the upper reaches of the Yellow River farmers receive 1,500 kg grain for each hectare rehabilitated with vegetative cover and 750 RMB (US$93); (b) in area of the Yangtze River farmers receive 2,250 kg of grain.
- In the next 5 years increased research will be devoted to sustainable resource development, such as solar energy and methane in rural areas. As China prepares for entry into the World Trade Organization they must prepare for the measures and policies that will be required to participate.

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[1] A relatively new policy: Land is owned by the government and is leased to farmers for 15-year periods, with the likelihood that the lease term will be extended to 30 years. Farmers have considerable freedom over what to produce and how to produce it.

- Enhance efforts to control and diminish the problems of serious diseases of plants and animals.
- Enhance research and development of biological medicines.
- Increase education of farmers: of a 1.3 billion population 900 million are in rural areas — 70% have received less than a middle school education; 20% are illiterate, i.e. 180 million people. The aim is to improve education of all types.

As for the identification of NWSTUAF as a partner, it is a good choice. There are 63 agricultural universities in China, 7 that are under the MOA. NWSTUAF is one of the key universities, being the largest in the provinces and autonomous region of northwest China (Xingjiang, Ganzu, Ningxia, Shaanxi and Inner Mongolia). NWSTUAF is the result of a consolidation of seven institutes in September 1999.

The Vice-Minister spent 23 years in Yangling prior to his most recent 3 years in Beijing. It is a very different place now because of central government support. For example, in 1982 when China received its first World Bank loan, NWSTUAF received US$10 million to build and equip the central testing lab. The university received 20 million RMB (US$2.47 million) for research and extension directed at the Loess Plateau area, not including the salary and infrastructure costs. After the merger of institutes into the NWSTUAF, 1 billion RMB (US$123.9 million) was allocated for the development of the university. These figures demonstrate the government s commitment to achieving its objectives. Large projects are being planned on dryland farming and water saving technologies. These will be integrated development efforts with the collaboration of NWSTUAF, the Yellow River Conservancy Commission, the State Planning and Development Commission, the State Forestry Commission, the Ministry of Water Resources and the MOA.

The Vice-Minister placed great importance on international cooperation and collaboration. He was pleased that we were working with NWSTUAF and felt confident that our cooperation would succeed. The university should fare well in applying to the NNSFC for grants and obtaining future support from the MOA. The opportunity for meaningful, collaborative research with U.S. scientists appears good, on both political and technical grounds in China. The president of the university, Prof. Chen Zongxing, is also Vice-Governor of Shaanxi Province; the Province shares supporting and administrating roles in governing the university with the Ministry of Agriculture.

APPENDIX 2: NATIONAL NATURAL SCIENCE FOUNDATION OF CHINA (NNSFC) NOTES FROM VICE-PRESIDENT ZHU ZUOYAN

The U.S. delegation met with Dr. Zhu Zuoyan, Vice-President of the NNSFC and member of China s Academia Sinica, and other members of the NNSFC staff including: Dr. Chang Qing, Deputy Director-General, Bureau of International Cooperation; Dr. Feng Feng, Director and Associate Professor, Division of Agriculture and Department of Life Sciences; Dr. Chen Huai, Director and Associate Professor, Division of American, Oceanian and East European Programs, Bureau of International Cooperation; Dr. Li Wanhong, Professor of Geotechnical Engineering, Division Chief of Hydraulic Engineering, Department of Engineering and Material Science; Dr. He Minghong, Professor and Deputy Director, Department of Engineering and Material Sciences; Dr Chen Yue, Deputy Director, Department of Life Sciences, Division of Zoology, Animal Husbandry, Veterinary Medicine and Aquatic Science.

V.P. Zhu outlined the government s theme of green mountains, clear water particularly as it pertains to China s northwest region, the Yellow River and the loess plateau. He reinforced NWSTUAF s responsibility as the University gateway to the west and the responsibility of NNSFC to assist wherever possible.

Over 1,000 proposals were submitted to the NNSFC Division of Agriculture this year — about 150 will be approved. Two thirds of the proposals are from China s universities. The Division of Hydrology received 317 proposals that will result in about 15 new projects. There are over 20,000 research proposals submitted annually to NNSFC; about 48% of which are submitted to Life Sciences. We were provided English language copies of NNSFC s Guide to Programs; Fiscal Year 2000. The Guide outlines current priorities, ongoing projects and funding in each of its major divisions. An English version of their 1999 Annual Report is also available. The Annual Report shows events (such as the opening ceremony for the Sino-German Center for Research Promotion), research awards, program review results and funding for projects. English version copies of the NNSFC Bulletin were distributed which highlight a few projects in greater detail.

Several special funding categories have been established to create alternative funding opportunities and encourage development of a solid base of research. Considering the stiff competition (overall, about 10-15% of proposals submitted are approved), this is a good idea. It appears that NNSFC has borrowed some of the best ideas from around the world to develop these special funds: a) Distinguished Young Scientist Program; b) Rural Scientist Program; c) Creative Work Group Program; d) Fostering Talents in Basic Science; and e) Projects for Fostering New Ideas and New Concepts in High Technology. The new Creative Work Group Program seems to be patterned after the Max Planck Institutes.

The NNSFC currently has annual budget of 1.6 billion RMB (US$123.9 million) and has received annual budget increases of 30% per year since its establishment in 1986.

The NNSFC supports the idea of a Joint Center and will give highest priority consideration for proposals from the Center that: a) address a priority basic or applied science topic; b) are submitted jointly by Chinese and U.S. scientists; and c) help develop western China. Drs. Chen and Chang were identified to provide necessary backstopping to the effort.

APPENDIX 3: SUMMARY OF U.S. DELEGATION MEETINGS WITH THE YELLOW RIVER CONSERVANCY COMMISSION (YRCC), 24-28 APRIL 2001

A U.S. delegation visited Beijing and locations in northwest China at Chinese invitation to consider developing a Sino-U.S. Institute on Soil and Water Conservation and Environmental Protection. This is a summary of observations related to our exchanges with the Yellow River Conservancy Commission (YRCC). Appendix 6 provides the itinerary for April 21 to May 10.

The YRCC, headquartered in Zhengzhou, is a part of the China Ministry of Water Resources. YRCC operates independently from Provincial authorities, although most, if not all, of its ends are compatible with those of the Provinces that comprise the Yellow River Basin. YRCC is the only organization within China that has an overview of the entire 750,000-km^2 Yellow River watershed (640,000 km^2 of which form the Loess Plateau). With about 27,000 employees, it was our impression that YRCC is responsible for many of the functions that the USGS, Army Corps of Engineers, Bureau of Reclamation, and U.S. Environmental Protection Agency perform in the U.S.

Shi Chunxian, Vice President, YRCC, led the group of scientists and managers that received our delegation in Zhengzhou. YRCC staff gave presentations about their activities and goals through a translator (Ms. Hao Fenghua). On behalf of the U.S. delegation, John Gray presented an Overview of Selected Programs and Tools for River Management in the United States, to an audience of about 30 YRCC staff.

Similar to what USGS would be responsible for in the U.S., the YRCC measures flow, sediment transport, and water-quality of the Yellow River at a number of gauging stations. Our delegation visited four YRCC facilities, including two gauge locations on the Yellow River. They use a sonic sounder and telemetry to measure stage and transmit stage (accurate to +/- 1 cm). They indicated that the accuracy of Yellow River stage-discharge relations was sufficiently indeterminate that they measure discharge and sediment transport (presumably suspended sediment) daily from boats.

We were struck by the magnitude of two fluvial processes in the Yellow River Basin:

1. EROSION: Excessive erosion by water, wind, and gravity in the Loess Plateau region of the Yellow River Basin. The highly erodable loess is as much as 300 meters thick in parts of the basin. Surface relief is high in most parts of the Loess Plateau and vegetation is generally sparse. Most rain, about two-thirds of the annual average, occurs during late June through September, and results in a relatively large percentage of surface runoff (the Ministry of Agriculture indicated that 75 percent of rain formed runoff, implying that this was surface runoff). The surface runoff conveys extremely large concentrations of silt and fine sand to receiving waters. The lower reaches of the Yellow River receive an annual average of 1.6 billion metric tons of sediment in its lower reach. This is probably the largest sediment load per volume discharge for the world s largest rivers. The Mississippi River, with about 5 times the drainage area of the Yellow River, conveys on average about 208 million metric tons annually, or about a seventh of Yellow River loads. The YRCC hopes to reduce the 1.6 billion tons to 0.9 billion tons over the next 30-50 years.

2. DEPOSITION: The elevation of the base of the Yellow River in its lower reach near Kaifeng is 13 meters above the elevation of the lower lands on the outside of the

dikes. Deposition continues to occur at a rate of about a meter a decade. The dike near Zhengzhou rises 10-15 meters above the low-flow water-surface elevation.

There is little doubt that the two problems are directly related.

A major focus of the Chinese is increased agricultural production in the Loess Plateau region, associated with reduced runoff and sediment transport.

The Northwest Sci-Tech University of Agriculture and Forestry, which issued the invitation to visit China toward developing a Sino-U.S. Institute, is not organizationally connected to YRCC. However, the U.S. Delegation was assured that there is considerable collaboration between the University and YRCC. If the scope of the proposed institute includes the entire Yellow River Basin, the YRCC s involvement in the Institute could be essential.

APPENDIX 4: THE WORLD BANK OFFICE IN BEIJING, NOTES FROM MR. RICHARD REIDINGER (FOR MR. JUERGEN VOEGELE)

The Loess Plateau was formed about 2 million years ago from wind-blown sediment. It is about 640,000 km^2 with a depth of 100 — 300 m.The sediment contribution to the Yellow River is 1.6 billion tons per annum. Rainfall averages 200 —550 mm per annum, with 60% falling in summer. The area has cold winters, hot summers and fairly fertile soil. The Loess Plateau is characterized highly erodible sediment of silt and very fine sand, very high rates of erosion induced by land-use practices, deforestation, erratic precipitation patterns and overpopulation.

China Loess Plateau Project Information: Total project cost $248.7 m, Loess Plateau Project takes place on an area of 15,000 km^2 in nine major watersheds in 4 provinces containing 21 counties, 800 small watersheds, 2,000 villages and 3,000,000 people. The project components include terracing (90,000 ha), silt retention dams (several thousand), Fruit trees (30,000 ha), afforestation (250,000 ha), grassland development (100,000 ha), irrigation, fruit storage, cattle breeding etc., Loess Plateau Project financing includes World Bank Credit ($150 million - interest free); Farmer contribution ($50 million equivalent in labor and cash); Central Government ($10 million); Provinces ($30 million); Prefectures/counties ($10 million) for a total of $250 million. Project duration 1994-ongoing. Implementing Agency: Ministry of Water Resources.

Background: Large parts in the project area are severely degraded and current agricultural practices are unsustainable. Deforestation, overpopulation and frequent droughts exacerbate the problem. Forty percent of the project area is classified as unused wasteland. The project covers areas in the provinces of Gansu, Shanxi, Inner Mongolia and Shaanxi; a total of 15,000 km^2 of land in 9 tributary watersheds of the Yellow River. Precipitation averaging 200 to 500 mm per year occurs mainly during summer months, between the months of July through September. About 280,000 people are expected to benefit directly from the project.

Objectives: To increase agricultural production and incomes and economic stability through the efficient use of land and water resources, to reduce erosion and sediment inputs to the Yellow River, and to reduce rates of sedimentation along the Yellow River downstream from Zhengzhou.

Project interventions:

- Integrated watershed planning was applied to all project areas. This required extensive consultations with farmers on their role and responsibilities in the implementation process, choices of locations and tree and shrub varieties, loan and repayment conditions.
- Terracing of 84,000 ha to convert cultivated sloping land into level fields that stabilized and increased yields. Sediment control dams (123) were built at the outlet of watersheds with areas of 3-5 km^2 to intercept sediment, create land, control floods and store water for irrigation and village supply. These earthen dams are about 10-20 m in height. Gullies were stabilized through check dams (976 in total) to slow down the flow of water and thereby create land from deposited sediment. These are smaller in size (3-10 m). It takes about 3 years for land behind check dams to be suitable for cultivation and 8-10 years behind key dams.
- Slope conservation and afforestation on slopeland and wasteland was achieved with timber- (250,000 ha) and fruit-producing varieties (30,000 ha). Farmer-owned fruit storage facilities (140) were constructed with a capacity of 30-50 tons. Forages were developed through the growing of pasture grasses on undeveloped lands, and natural revegetation on about 90,000 ha. Two hundred hectares of seedling nurseries were established to satisfy the local demand for seedlings.

Project impact:

- Integrated watershed planning and management is applied to the entire project area, which lead to an appropriate balance between areas treated for production and those protected. Farmers income for both the short- and long-term are taken into account.
- The project managed to control grazing in the watershed and allowed the grasses, shrubs and trees to establish. Grazing control has changed the traditional method of livestock husbandry. The project compensates farmers through loans for sheds, fodder processing equipment or more suitable animals (cows and sheep rather than goats).

- The project has been exceptional in that it combines both poverty alleviation and environmental improvement by targeting some of the poorest counties in China and selecting those counties that suffer from severe soil erosion.
- Agricultural production and consumption levels increased between 50% and 100% in most project areas. Much of the project area suffered a severe drought in 1999 and 2000; whereas there often was a complete crop failure on cultivated slopes, the newly established terraces yielded a grain crop.
- Although more monitoring data on socio-economic conditions are needed, the project has significantly raised and diversified incomes of poor farmers and improved environmental conditions by applying measures to reduce soil loss and improve agricultural production.
- Buried water tanks to store rainwater were installed to prepare against the frequent droughts in recent years.
- The project contributed to improving land tenure for beneficiaries by utilizing a recently passed national law to help promote the establishment of long-term land use contracts in the project area (30 years for arable and 50-70 years for grazing land) in order for the beneficiaries to have full rights to the increased agricultural produce and the incentive to maintain the natural resource management investments.
- In the area of grazing management, the project had a major impact. Several counties decided to ban grazing on land both inside and outside the project area or else they encouraged rotational grazing. A shift from small ruminants to cows, pigs and pen-fed sheep has been documented.
- Small feed processing plants (125) have been set up.
- Most counties have prepared livestock management plans, showing fodder and livestock balances and the effect of land use changes.
- Strong governmental commitment sustained project achievements, national leaders visited the project site on numerous occasions and believe the project served as a catalyst for new initiatives; *i.e.* ambitious national conservation programs have been put into place by the government for the Loess Plateau region, combining soil and water conservation with gains in agricultural production.
- In the national Chinese projects that are being developed, planning and management tools introduced under Phase I of the Loess Plateau are being used.

Issues and elements of success:

- There is room for improvement on the practices followed in tree planting, particularly seedling quality and the handling of seedlings. The transplanting shock should be minimized by nursery practices that promote fewer but stronger seedling roots. Current nursery practices are designed for maximum seedling production but more attention needs to be given to quality.
- Elements of success included (a) strong local participation, (b) serious government commitment at all levels, (c) components based on successful pilot trials and experiments, (d) massive public relations campaigns, (e) a simple but integrated design, (f) long-term land-use rights (30-50- years) for individual farmers, and (g) attentive project management with emphasis on technical quality and financial responsibility.

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APPENDIX 7: SCHEDULE OF MEETINGS & FIELD TOURS

U.S. China Cooperation on Soil and Water Conservation and Environmental Protection

April 21: Most of the pre-tour group departed for Beijing.

April 22: Arrived Beijing.

April 23: Meeting was held at the World Bank Resident Office in Beijing at 10 a.m.
Flew to Zhengzhou at 9 p.m.

April 24: Met with the Yellow River Conservancy Commission (YRCC). Toured the Yellow River Museum and Hydraulic Lab in the afternoon.

April 25: Briefed by YRCC with discussion in the morning and John Gray s USGS presentation on behalf of the delegation in the afternoon.

April 26: Drove from Zhengzhou to Kaifeng and returned to Zhengzhou.

April 27: Drove from Zhengzhou to Luoyang with a stop at Xiaolongdi dam.

April 28: Drove from Luoyang to Xian with visit to Tongguan Hydrology Station to discuss sedimentation issues.

April 29: Drove from Xian to Yangling with a stop at the YRCC office in Xian.

April 30: Workshop and discussion at NWSTUAF with Executive Vice President Li.

May 1: Morning discussions of future cooperation and proposals: U.S./ China Joint Science and Technology Center in Yangling. Visited the Irrigation Experiment Station, Insect Museum and Precipitation Laboratory in the afternoon. Evening dinner party hosted by NWSTUAF.

May 2: Toured local area and saw the Qianxian Experiment Station and the Chien-ling tomb.

May 3: Visited Emperor Qin's museum housing the Terra-Cotta Army. Evening dinner with Professor Chen (President of NWSTUAF and Vice-Governor of Shaanxi Province).

May 4: Drove from Xi'an to Hu-kou Falls and on the way visited different types of loess and soil erosion.

May 5: Visited Ansai Experiment Station and Yan'ergou valley management.

May 6: Drove from Yan an to Yulin.

May 7: Drove from Yulin to Baotou.

May 8: Flew from Baotou to Beijing and met with administrators from the National Natural Resource Foundation of China and later with administrators from the Ministry of Agriculture. Evening dinner hosted by Vice-Minister Zhang Baowen, Ministry of Agriculture.

APPENDIX 7: LETTER TO VICE PRESIDENT, NORTHWEST SCI-TECH UNIVERSITY OF AGRICULTURE AND FORESTRY

6 June 2001

Dear Dr. Li:

On behalf of all my colleagues who participated in our recent mission to Yangling, I want to extend our sincere thanks for the hospitality and generosity extended to us by you and your staff. We were especially honored by your presence during the field tour.

We have taken a long time to respond because we have been busy briefing our Agencies about our mission so we could report to you with confidence that the reactions to our reports were positive.

We have also worked hard to assure that all mission members had an opportunity to make their changes and suggestions to the current version of the trip notes that we attach for your information. We hope that you and your component of the Organizing Committee will share our notes with all of the Chinese participants, but before you do, please read them carefully and make any necessary changes that you think are necessary to create the best possible impact from your point of view.

We do not have much new information to report at this time, as we will now start the process of assembling our end of the Organizing Committee to make progress on the detailed terms of reference for our side.

All of our colleagues have shared photographs and warm stories about the trip. All of us, including the wives who accompanied us, have a singular opinion of gratitude for the extraordinary hospitality and commitment that you and your group put into hosting our visit. We all want to continue our cooperation, and realize that it will require persistence and hard work. Thank you for extending your hand in this spirit of friendship and collaboration.

Sincerely,

Dick Amerman
for the U.S Delegation to China,
April-May 2001