A WORKSHOP SERIES ON THE CHINESE DEVELOPMENT EXPERIENCE

FINAL REPORT

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I. SUMMARY

A series of workshops were held in October-December, 1980 for AID technical experts and administrators to review the Chinese development experience in the fields of agriculture, population, health and nutrition, and energy. These workshops responded to a request from AID for assistance in reviewing aspects of Chinese experience within these areas which have potential application in other developing countries. Thus the emphasis of prepared papers and workshop discussion was on the potential (or lack thereof) for transferability of specific programs, institutions or innovations.

The discussions centered around two different notions of the meaning of "transferability": (1) a high potential for successfully applying a Chinese program, institution or innovation in another LDC context; (2) a potential for deriving a better understanding of the ingredients of a successful approach for dealing with a particular development problem, as well as a more realistic conception of the limitations of various approaches.

The scope for the first type of transferability appeared limited: many highly-touted Chinese programs are uneconomic or less successful than they have been made to appear. In other instances, the successful implementation of a Chinese program, institution or innovation is attributable to the Chinese (or East Asian) political, social, or economic milieu. Of the remaining cases which were considered, in many instances international institutions are already involved in evaluation or promotion of

transfers to other LDCs, making further efforts by AID potentially redundant.

The potential for transferability in the second and broader sense of the word appeared much greater. Many of the Chinese programs in the fields of agriculture, population, health and nutrition, and energy are characterized by decentralized, mass-oriented delivery systems, small-scale technology, and high labor-intensity. In these respects they often differ substantially from programs dealing with similar problems in other LDCs, and often accord with prescriptions of development theoreticians. Consequently, examination of the workings of such Chinese programs by experts and administrators from AID or from other LDCs may stimulate new approaches or inspire rethinking of old ideas. This is so regardless of whether the Chinese programs constitute successes or failures, but it was pointed out in workshop discussions that the Chinese Government rarely facilitates the study of its failures.

In general, the papers and discussion pointed up the fact that most of the subject areas had already received the attention of delegations to the PRC, and that further visits of this sort were less desireable than long-term, on-the-ground studies by smaller numbers of individuals, to the extent that this can be arranged with the Chinese Government.

Aside from these general conclusions, there was general agreement on some specific programs, institutions and innovations which are most suitable candidates for further study by AID personnel:

-- agrotechnical extension system;

-- pest control system;

-- multiple cropping and intercropping;

-- animal husbandry;

-- grain storage system;

-- small-scale rural industry;

-- organization of water management;

-- "community-based delivery" system for health care;

-- incentive/disincentive system promoting family planning;

-- vaccination program;

-- certain biomedical innovations;

-- biogas digester program in Szechuan;

-- rural small-scale hydroelectric power delivery systems.

The topics on the above list are not necessarily of equal priority or interest. Moreover, the discussion at each workshop, as summarized below, suggests that few are directly or immediately transferable, and often only particular aspects of each topic are of interest to AID. Nevertheless, this list reflects considerable weeding by both outside specialists and AID participants from the original agenda, and provides a basis for selecting the directions of any further work on China to be done by AID.

II. WORKSHOP ON AGRICULTURAL DEVELOPMENT

The workshop on agricultural development, held on October 29, 1980, was addressed by Professor Robert Dernberger (Department of Economics, University of Michigan), giving an overview of Chinese agricultural development, and by Dr. Thomas Wiens (Senior Economist, Mathtech, Inc.), on transferability, with comments by Professor Randolph Barker (Department of Agricultural Economics, Cornell University).

Professor Dernberger provided an extensive, chronological discussion of China's experience in agricultural development over a span of centuries. He noted the heritage of an agriculture based on private property rights, fragmented family farming, and intensified production techniques which had allowed a long-term population growth with little change in per capita standards of living. Early diagnoses of the agrarian problem could be divided into those which sought remedies in improved distribution of income (via land reform and a presumed stimulus to peasant investment) and changes in rural institutions, and others which looked to government programs and industrial support for technological improvements as the key to progress (without a necessary change in the distribution of land ownership).

The earlier controversies carried over into a post-1949 long-term struggle between right and left wings of the CCP over rural policies. In outlining the series of organizational changes during this period--from land reform through full communization--Prof. Dernberger emphasized the impacts on incentives and decisionmaking. The main thrusts of left-wing

policies, which were periodically ascendant, were toward suppression of "vestiges" of capitalism such as private plots and lucrative sideline activities, rural free markets, specialization, and distributional schemes based on material incentives. At the same time they promoted rural small-scale industrial development as part of an attempt to reduce rural/urban income differentials. The right wing, in contrast, emphasized policies which gave material incentives to the peasants, encouraged specialization and low-level decisionmaking, and advanced overall levels of production even if at the expense of decreased distributional equity. Although the right wing now has control, Dernberger noted a variety of problems faced, including resistance to reforms, the inconsistency with which they are enforced, their adverse effects on equity, and weaknesses of the infrastructure especially in the S&T area.

Aside from developments in policy and practice, Prof. Dernberger outlined the technical developments which allowed the PRC to sustain an increasing population, albeit at declining rather than increasing labor productivity levels. During the 1950s, these developments primarily involved a step up in the rate of intensification without major changes in technology. In the past two decades, on the other hand, the PRC has introduced new seeds and cropping methods (including intercropping, multiple cropping, transplanting, and close-cropping techniques), promoted farm land reconstruction (levelling, enlargement, drainage, and soil improvement), irrigation schemes, mechanization, and small-scale rural industry. Chemical fertilizer supplies and other

modern inputs have grown rapidly, on the basis of imports of foreign plants and expansion of domestic production capacity.

In conclusion, considering the question of transferability, Prof. Dernberger, while noting the extent to which the Chinese could draw on historical tradition and a host of unique circumstances, at the same time felt that the PRC's rich experience in problem solving in agriculture contained lessons of value to other LDCs.

Dr. Wiens began his presentation by acknowledging that such success as China has had with overall agricultural development is due primarily to conventional sources of development, but that unusual and innovative elements of their experience could be found which were applicable in other LDCs. He chose to emphasize techniques and technologies in his search for transferable elements because of the difficulty of isolating institutions, policies and programs from their cultural and institutional contexts. Even here he offered three caveats: (1) a favorable benefit/cost ratio in the Chinese institutional context cannot be easily extrapolated to market economies; (2) it cannot be assumed that a technique/technology which is widely adopted in Chinese agriculture is economically advantageous even in the Chinese institutional context; and (3) very little work has been done in China to evaluate the costs and benefits of alternative techniques/technologies. Hence careful, specially-conducted studies, in and outside of China, were required before transferabilty could be accurately assessed.

Despite these caviats, Dr. Wiens went on to make preliminary judgments about transferability in the following subject areas:

(1) hybrid rice; (2) triticales and production of tubers from true seed; (3) azolla, water crops, and organic fertilizer use; (4) pelletized fertilizers; (5) multiple cropping and intercropping; (6) small-scale farm machinery; (7) pest control; (8) freshwater fisheries and aquaculture; (9) "forestry support for agriculture;" and (10) animal husbandry. In each area, he noted what was unique or innovative about Chinese research or practice, the probable limitations on transferability, and the international institutions, if any, which had already become interested, leaving a residual which AID might find it worthwhile to explore further (listed at the end of the section).

Dr. Wiens then turned to a discussion of the Chinese agrotechnical extension network (or "four-level agro-scientific network", as the Chinese call it), as representing an impressively effective rural institution responsible for the dissemination or delivery of the techniques/technologies/programs previously discussed. In accounting for its effectiveness, he noted a variety of factors: the large percentage of the rural population involved, their responsibility to the producing farm enterprise, local or self-financing, the recruitment and training process, and (not least) the power over farm practice of the authoritarian political-economic structure. Although he was skeptical about transferability because many of these factors were intimately bound up with the socialist organization framework of Chinese agriculture, Dr. Wiens felt that there was value in studying what was involved in developing such a successful extension network.

As Dr. Wiens had concentrated the majority of his attention on the question of the direct transferability of specific technical and institutional innovations to other LDCs, Prof. Barker's comments examined transferability in a broader sense of the word. He noted that the discussion was reminiscent of a similar interest circa 1963 in what portions of the Taiwan experience in agricultural development were transferable; that at the time there was the same concern that the unique cultural context limited transferability. As to the significance of cultural context, he pointed to comparatility of Chinese farmers with American Amish and Mennonite farmers, who also are very meticulous and inclined to exploit family labor, and whose practices can only survive in the context of their particular culture.

China's situation, he noted, was unique even in the context of Asian agriculture. While it shared the same population pressures as other East Asian countries, the others (Japan-Korea-Taiwan) had established the preconditions for modernization several decades ahead of China, including extension, research, transport, and input-manufacturing systems. By the time population pressure was serious, industry could absorb it; but in any case the initial rate of population growth had been lower than in China. Other, southeast Asian countries, while lacking early fulfillment of these preconditions, did have new lands to exploit, and began from such a low level of crop intensity that it was easy for them to exploit the potential for intensification. In contrast, China was forced to depend much more heavily on new technology to shift the production function,

while simultaneously developing preconditions and attempting to reduce population growth.

Dr. Barker noted that China was not alone in simultaneously promoting labor-intensive agriculture and the increased use of modern inputs while squeezing the agricultural sector as much as it could in the interest of industrialization. While contrary to the advice of agricultural economists at the time, these policies nevertheless worked. China's problem, on the other hand, is that because the technological backlog is virtually exhausted, it can no longer squeeze so hard as it did in the past.

He noted that borrowing from other models invariably involves adaptation or modification. It is not important whether something can be transferred in toto--merely that something can be learned from the other's experience. As examples, he cited the Phillipines' study of land reform in Taiwan, which led to a very different program in the former country. Similarily, in adapting Taiwan's Farm Associations, the Malaysians ignored the fact that the key to their success was the monopoly on commercial inputs and, as a result, the Malaysian variants are quite different in nature and function.

The scientists have already been to China, and looked at Chinese research, and this experience has had a significant impact on what is done at IRRI and similar institutions, for example. In his opinion, administrators need the same kind of experience.

Dr. Barker agreed that the Chinese extension service deserved examination by AID. Although it is weak in research and

organization at its upper levels, its strength, in common with Taiwan, Korea and Japan, is in its organization and "delivery" at the lower levels. In this respect it is in direct contrast with the rest of Asia, and provides food for thought about the tradeoffs in upper/lower level strengths/weaknesses.

The Chinese water management system is also of interest, given the low levels of efficiency elsewhere in Asia (although the speakers were not sure that China's efficiency was that much higher, if at all).

Finally, he noted that Indonesia (especially Java) might gain the most from immediate transfer of aspects of the Chinese experience, in view of similarities in population pressure, technology, and social structure. For other countries, China's agricultural experience may help them deal with problems which lie down the road, when the "easy" solutions have run out.

The afternoon discussion focussed on a "menu" of subject areas in which the potential for transfer was significant, and extensions to that menu suggested by AID personnel and considered by the outside specialists. Rather than summarize this discussion, it is most useful to classify it into two lists, of areas which AID need not explore further (at least through direct exchanges with the PRC) and areas to which AID should give further attention.

First, the areas which can be rejected include:

1) Hybrid rice, triticales, production of tubers from true seed, azolla, water crops, organic fertilizer use, and pelletized fertilizers: in each of these areas, other U.S. or international agricultural institutions have already begun active research,

exploiting whatever could be learned from Chinese experience, and there is no advantage to duplicating their efforts.

2) Freshwater fisheries and aquaculture; forestry support for agriculture; hydraulic engineering: in these areas, what China can offer is either not very significant or not unique, or else too dependent on the mode of organization.

3) National planning apparatus: not very sophisticated, however ambitious, and difficult to do an objective study.

4) Small-scale tools and implements: with certain exceptions, China has not been very successful in improving on traditional designs. Ferro-cement boat construction, among the exceptions, can be studied elsewhere.

5) Agricultural machinery in general: something may be learned from the design philosophy, production technique, and from a few individual designs which may be applicable elsewhere. But in the area of "difficult designs", where needs elsewhere are greatest, the Chinese haven't made much progress, and are looking to the West for assistance.

6) Food marketing and distribution system; production incentives: not necessarily superior to those in other LDCs, indeed weak spots in the Chinese program, and where successful, due to cultural/historical factors which are not transferable.

7) soil stabilization and conservation practices: probably not unique, and certainly less than fully successful, in view of continuing erosion and desertification problems.

In contrast to these areas, there seemed to be general agreement that the following are areas in which something can be

learned from the PRC which could be useful to AID in its mission to aid other LDCs:

1) the extension system: while there are many aspects of this system which are inseparable from the socialist framework found in China, it effectiveness is acknowledged, it contrasts with the systems commonly found elsewhere, and a better understanding of how it works could stimulate new thinking by AID and LDC experts.

2) pest control system: the program as a whole is innovative and apparently successful, and worthy of study;

3) multiple cropping and intercropping: the Chinese have much practical experience in this area, which hasn't been well-researched elsewhere and is of growing interest abroad (with the caviat that many Chinese practices may not be economic and that recent developments in this area in China take these practices to an intensive frontier which lies far down the road for most other LDCs).

4) animal husbandry: in certain aspects, experimental work, practical technique, germ plasm, and grass-roots programs are of potential utility in other LDCs.

5) grain storage system: China has an extensive, professionalized grain storage system, the physical and organizational aspects of which might serve as the model for an attractive alternative to on-farm storage in other LDCs (although its economic efficiency remains to be evaluated).

6) small-scale rural industry: it may be valuable for AID to examine and draw its own conclusions about China's extensive experience in this sphere, even though there may be few transferable bits of "finished technology" and the overall

efficiency may be currently subject to challenge.

7) organization of water management: as a "hydraulic civilization" of long standing, China at least has vaste experience to offer on a problem which bedevils many other LDCs, even though it is not clear that her solutions have been more efficient.

In this final "menu" of seven subject areas of varying breadth, there appears to be an opportunity of sufficient scope for AID to derive information from the Chinese experience which can be applied in other LDCs.

III. HEALTH, POPULATION AND NUTRITION

The workshop on Health, Population and Nutrition in the PRC, held on November 5, 1980, was addressed by Professor Peter (Pi-chao) Chen, of the Political Science Department at Wayne State University, on the characteristics of China's health delivery system and family planning program. There followed a panel in which Dr. Nicholas Wright (epidemiologist at NICHD, NIH) and Dr. Joe Wray (Division of International Health Programs, Harvard School of Public Health) gave their observations on the health and family planning systems, with particular attention to the potential for transfer.

Prof. Chen's paper covered China's birth planning program, emphasizing current policies and practices (he distributed an additional paper on the rural health care system which will not be summarized here). He stressed that birth planning activities and contraceptive delivery were community-based, in terms of personnel recruitment, organizational responsibilities, "propaganda" activities, and service delivery. In the rural areas, the program is integrated with the rural health care system (the "barefoot doctor" network); is based primarily on IUDs but also promotes other forms of contraception, including surgical procedures such as tubal ligation, vasectomy, and induced abortion. Service delivery is free, and surgical operations on females are subsidized by a "paid leave" policy, even in the rural areas.

State policy on birth planning now involves three norms--late marriage, long spacing between births, and few children (the

current norm being two, but one-child families strongly encouraged). Specific indices are used to measure population compliance with each norm, to set targets for areas, and provide birth quotas for individual families. The process of quota setting is collective and local, within the limits of targets passed down from higher level authorities. Couples well-exceeding norms may also become targets for sterilization. This system, which virtually takes childbearing decisions out of the hands of the family, is heavily reinforced by group and state sanctions as well as (increasingly) material incentives. Nevertheless, nearly a third of the population appeared to be evading compliance (1978).

Dr. Wray contributed two 1973 papers on child care in the PRC based on his participation in a delegation at that time. The major points covered in these papers were summarized in his presentation:

Dr. Wray reviewed the characteristics of the Chinese health care system, his major observation being that the Chinese were carrying out in practice many ideas which public health workers have advocated for years. One of the main arguments which emerges for studying Chinese experience is that public health (or family planning) administrators in other LDCs, despite their acceptance of these ideas in principle, have no confidence that they can be successfully carried out. China can therefore provide the example needed to convince them, and, if its programs can be carefully dissected, perhaps also provide some notion of the mechanisms which could work in other LDCs as well.

Among the specific features of the Chinese system mentioned by Dr. Wray are:

--centralized policy, but decentralized delivery and administration;

--accessibility (geographic, social, and economic) of the delivery system to its recipients;

--broad outreach and coverage;

--a referral system, with backup facilities;

--combination of traditional and modern treatments;

--and therefore costs contained;

--extensive health education efforts, based on Mao's line, stressing prevention and the rural areas.

Among the unusual characteristics of Chinese health personnel are their:

--training (brief but continuing, with close supervision);

--lack of social distance;

--accountability and commitment to the population they serve;

--low salaries (at lowest levels, paid in workpoints);

--abundance and coverage.

Among the distinct features of their training are:

--selection based on desire and commitment;

--local rather than distant training facilities;

--accessible trainers, with learning by doing rather than lectures;

--task-oriented rather than theoretical;

--supervision, follow-up, and continued inservice training.

Citing limited but impressive statistics on child health and development, Dr. Wray felt that these resulted from certain

positive factors in the Chinese program, including:

--general health of mothers;

--age and marital status at childbirth;

--social support systems;

--nutritional support for mothers-to-be;

--low female tobacco consumption;

--basic antenatal care widely available;

--obstetrical care provided primarily for small high-risk group; no anaesthesia at delivery (unless acupuncture).

--high birth weight averages (as a result of the above);

--infant nutrition support (breast feeding, supplements in nurseries);

--immunization program with broad coverage;

--well-child supervision;

--educational programs for mothers and grandmothers, etc.

The above features obviously suggest that the Chinese program is worthy of study. As to its transferability, this varies with component or characteristic. As an example of a potentially transferable component, Dr. Wray cited the immunization program, which he described as:

Priority--high

Scope--extensive (9 vaccines)

Vaccine supply--local

Distribution--vacuum bottle cold chain

Delivery--local health workers

Coverage--total population

Frequency--every 6 months.

Dr. Wright's comments primarily concerned the transferability of aspects of the Chinese health care and family planning programs. He saw difficulties in disentangling the mix of culture (Chinese drive, thirst for learning, etc.) and politics (political discipline, party repression at all levels) from other aspects of the program. For example, he noted that the "one-child" goal of the family planning program relied on a level of social persuasion hard to replicate outside China, and indeed even the Chinese may have a breaking point in this respect. In terms of contraceptive use, the Chinese have made all methods available, whereas few other LDCs have done so, but is this because of a morally permissive culture? Could the practice of late marriage be implemented in other countries which lack Chinese discipline? Could the aspects of the program which rely on the well-developed sense of the rights of women be implemented, for example, in Islamic countries? Other elements may be less difficult, e.g., breast feeding, where development of creche programs at work locations would suffice; or use of paramedical, local-level personnel, which the Chinese have carried unusually far, could be done elsewhere, but may require some "breaking down" of the resistance of conventional medical services.

Dr. Wright saw less difficulty in the potential for exploiting certain Chinese biomedical innovations in other countries. However, in most cases the Chinese have not yet provided the kinds of comparative information or proof of efficacy required to induce adoption. Moreover, some of the innovations are already the subject of investigation by other

organizations (e.g., the Rockefeller Foundation), and it may not be necessary for AID to directly involve itself. The innovations of possible interest he listed as:

1) a simple technique for vacuum aspiration for induced abortions;

2) acupuncture, especially as anaesthesia in operative family planning services (to reduce risk);

3) IUDs--the Chinese version has not been compared with others outside China;

4) vasectomy--including an excellent training movie demonstrating operative techniques and also a particular technique, the phenol injection method, which has not been well-documented so far;

5) gosopol as male contraceptive;

6) low-dose pill; simple methods for hormone production (paper pill abandoned due to chemical instability);

7) mix of herbal and modern medicine.

The remaining discussion at the workshop was loosely based on a compilation of a "concensus" list of "highly transferable," "marginal", and "not transferable" aspects of the Chinese health care and family planning systems. Since the comments generally reflected rather than modified this compilation, analysis of its contents provides the best summary of the conclusions of the workshop.

The aspects of the programs which the workshop participants regarded as non-transferable or "marginal" were generally those associated with the Chinese culture or political system. They included the de-emphasis on clinical medicine, promotion of

abortion, the birth quota, high status of women, late marriage and similar social norms, a strictly government-run medical system, and in general centralized planning and government policies.

The aspects of the programs which the participants viewed as having the most potential for transfer were:

(1) the "community-based delivery" system for health care in certain of its aspects: a) the local selection of service personel and local funding of the program (it was noted that family expenditures for "health care", broadly construed, in other LDCs were not necessarily smaller than the 1-2 percent of income required by the Chinese program, so that the potential for local funding existed); b) on-the-job training system; and c) a referral system, emphasizing paramedical care at the lowest level with referrals for more complicated cases. In short, it is the so-called "barefoot doctor" program which is of interest;

(2) the incentive/disincentive system used to promote family planning, insofar as it can be disassociated from the Chinese social context;

(3) the vaccination program (as explained in Dr. Wray's comments); and

(4) the biomedical innovations mentioned by Dr. Wright (see above), although some of these are best left to study by other organizations.

The value of looking at these programs is, again, best summed up in Dr. Wray's comment that the leaders of medical services in other LDCs are not confident that what they believe is necessary can really be delivered, and direct study of the

Chinese programs can provide that conviction as well as some insight into the means. Also, the workshop participants accepted Dr. Wray's assertion that what is needed is not further delegation visits, but people on the ground for a long time looking at how the system really works (including training and delivery).

IV. ENERGY DEVELOPMENT

The workshop on Chinese energy development, held on December 18, 1980, was addressed by Dr. Kim Woodard (Adjunct Research Associate, Resource Systems Institute, East-West Center, University of Hawaii), who provided background information on China's resources and rates of exploitation; Professor Vaclav Smil (Department of Geography, University of Manitoba), who spoke on the transferability issue; and Professor Thomas Rawski (Department of Political Economy, University of Toronto), who commented on the prior speaker's presentations and a number of related aspects of Chinese industrial development.

Dr. Woodard's presentation did not overlap with his paper, distributed in advance to participants. To summarize his comments, he provided a general overview of the availability of energy resources, their current levels of production, and past or expected rates of growth in the PRC, covering in particular coal, petroleum and natural gas, and electric power. He pointed out that China's coal reserves were the third largest in the world, and accounted for 70 percent of her energy consumption. Reserves, however defined, were clearly no constraint on

development. Growth trends for coal were high (8-10 percent) in the early 1970s, but have now slowed. In his opinion, this reflected an earlier ability to more thoroughly exploit underutilized capacity, which now has been largely exhausted. In addition, the sheer size of the existing industry makes it difficult to maintain high rates of growth. The major limits on future growth rates also include a) lack of washing and beneficiation facilities; b) inefficient transport system in need of major investments; c) possible difficulties on the consumption end in using coal in processes basically requiring petroleum products.

China's petroleum resource base was described as "moderate" on a world scale, with ultimately-recoverable reserves placed at one-fourth to one-half of the comparable U.S. figures. The major problem currently is that existing fields are reaching plateaus, forcing development of new fields. Among the constraints on the rate of development are a) geological factors in existing fields lead to low productivity wells with short time horizons; b) refinery capacity and productivity are weak. Growth rates currently much lower than in the past, but may pick up if further on-land reserves are found. Offshore fields seem promising, but development involves long lead times.

China's electric power resource base is potentially enormous, in view of substantial potential hydroelectric generating capacity, as well as thermal potential arising from coal, petroleum, uranium, and geothermal resources. On the production side, there are numerous difficulties, leading to serious shortage of power relative to growing industrial needs.

Current capacity tends to represent intermediate technology, intermediate-size plants, with intermediate-size generating units, whereas new capacity is expected to be large and modern, exceeding the Chinese domestic state-of-the-art and requiring foreign assistance.

Despite the overall size of China's energy industry, per capita production and consumption remain tiny. As Smil put it, large cities have energy consumption on, say, the Brazilian or Mexican level, whereas rural areas are more comparable to the Indian level (including dependence on fuelwood, broadly construed, and straw).

Professor Smil, in searching for areas where transferability was high, argued that "big technology" in China can be evaluated as inferior or no better than that in most developed and many developing countries, and that there is therefore nothing worth "transfering" here. At the level of intermediate scale and technology, China certainly can produce, but domestic demand exceeds supply, so there is no export potential. This leaves small-scale technology as an area in which transfer is conceivable. Smil finds biogas and small-scale hydropower as the subjects of most interest in this respect.

On the positive side, Smil noted that Chinese experience with biogas, in terms of scale (absolute or per capita) and rate of expansion, greatly exceeds that of any other country. And yet the Chinese experience indicates as well the limitations of this form of energy--that it requires a very specific climatic, economic and possibly even political environment if it is to

flourish. The last two are evidenced by the concentration of 5/7ths of Chinese biogas digesters in Szechuan Province, despite temperature conditions which are less than ideal, whereas in provinces like Guangdong, Guangxi, etc., where temperatures are ideal and the concentrations of animal and vegetable wastes appear adequate, the numbers of digesters appear too low. Among the factors which may account for this anomaly are: a) the southeastern provinces may possess sufficient fuelwood/brush; b) the demand for the use of straw as construction material is exceptionally high in Szechuan, where clay soil is either in short supply or must be exploited for cultivation; c) the concentration of human and animal population per hectare is higher in Szechuan than elsewhere in China; d) the political leaders in Szechuan may have forced widespread adoption of biogas digesters despite lack of local acceptance. Despite the emphasis on biogas in earlier energy plans, Smil saw in the making a failure to achieve anything like the growth in numbers of digesters previously envisioned by Chinese leaders.

Dr. Smil saw the advantages of small-scale hydropower development in the multiple-use potential (water storage, aquaculture, etc. as well as energy-generation) and the reduction of distribution costs, which might be prohibitive for large-scale networks attempting to deliver power to isolated rural districts. (It was also pointed out in discussion that this would be especially true if production and distribution to end-use used the same voltages, obviating the use of high-voltage transformers and transmission lines.) The latest statistics suggest that some 47 percent of rural electricity comes from

"small stations", although this figure is deceptive in view of the inclusion of rather large stations in the figure which account for a disproportionate percentage of the power.

Nevertheless, most small stations are not integrated into networks, and therefore losses due to underutilization are quite high. To remedy this, the Chinese are attempting to bring about such integration, but at the same time, current trends are toward installation of larger stations which can be more fully utilized.

On the whole, while acknowledging the usefulness of biogas and small-scale hydropower in the Chinese context, Dr. Smil emphasized their limitations, and particularily those limiting transferability. He also pointed out that the Chinese, often in conjunction with international organizations, were already making efforts to transfer these technologies to other countries, and so argued that further efforts by AID were redundant.

In commenting on the speakers' presentations, Dr. Rawski took a relatively optimistic tack, stressing the favorable record of China's development program and potential for further improvement especially through improved management. However, he also noted that small-scale technology in China, however well-publicized, was really not characteristic--most technology was conventional and large-scale, and even where small-scale technology had been promoted, its overall significance as a proportion of total production or consumption was not large. (E.g., even in Szechuan, biogas supplies energy mostly for household cooking, and for only part of the year at that, and this represents only a small fraction of rural energy

requirements.)

In response to audience interest in the impact of rural electrification, Dr. Rawski noted that it had released large amounts of labor (especially household labor) previously absorbed, for examples, in food processing (milling, feed processing), spinning (now done to order), or water supply. But at the same time it had created new opportunities which had absorbed much of the released labor. Intensification of cultivation, capital construction, and rural industry had absorbed (over the last two decades) a 40 percent increase in the rural labor force, with an increase of similar magnitude in labor time per worker, without a decline in output per man-year. It was not clear that this process could be continued, as further mechanization, chemicalization, etc. occur. (In later discussion, it was acknowledged that no one had demonstrated that this labor absorption was due to electrification per se.)

In the afternoon discussion, the speakers responded at some length to a number of interests and questions of the AID participants. They were asked what the economic and political factors were which caused the swings in emphases in Chinese policy from small to large-scale technologies. The speakers noted the leverage which large-scale enterprises afforded central planners, and the generally higher efficiency of the large-scale enterprises. In trying to demonstrate the superiority of the earlier emphasis on small-scale enterprises, one would stumble on the output quality problem, but there might be specific advantages which were crucial to specific types of industry: small-scale cement production because transport costs were high;

small-scale fertilizer because the Chinese did not initially have the technology to build large or sophisticated plants; and in the engineering industries, the advantages accruing from skill acquisition in the rural areas.

Asked about the existence of a rural-oriented, human development-oriented decentralization strategy in China, Dr. Rawski denied that there was such a strategy emphasizing the "quality of life", but agreed with Dr. Wiens that there was a regional decentralization strategy aimed at overcoming the effects of earlier coastal enclave development, and also a desire to avoid development of large, urban conglomerations.

Responding to a strong interest of several participants in the problems of fuelwood and forestry, it was pointed out that Chinese forest management policies had been unsuccessful (or even nonexistent until recently), and deforestation was a serious problem; that China had been rather more successful in rural afforestation "in support of agriculture" (see session on agriculture); that "fuelwood" in China's rural areas meant mainly brush, roots, grasses, and tree trimmings, and that rural afforestation was not generally aimed at establishing fuelwood stands for continuous harvesting. Nor had much Chinese work been directed at improving efficiency of rural stoves.

In bringing the discussion to a close by focussing on specific areas which AID should study further, there was some disagreement on whether forestry/fuelwood required further attention. Proponents argued that, since China's background and environment were comparable to those of other developing

countries, there was value in learning more about what China had done in this area. Others disagreed, noting that since China's record here was unsuccessful and since there were no technical lessons to learn, it would be better to invest the time in examining more successful models.

Despite the skepticism of some of the speakers, certain of the AID participants still felt that it would be worthwhile to look further at Chinese experience with biogas and small-scale hydropower. In the first case, it seemed necessary to look specifically at why biogas digesters were widely adopted in Szechuan Province, as opposed to elsewhere. In the second case, the focus should be on the economic advantages of decentralized power production and distribution systems vs. those of distribution from centralized systems. Any answers to the question of transferability in the energy area would seem to require prior exploration of these two topics.