APPROACHES TO APPROPRIATE AGRICULTURAL TECHNOLOGY IN EGYPT:
A SPECIAL CASE STUDY EVALUATION

ROBERT W. PEARSON
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Approaches to Appropriate Agricultural Technology (AAT) in Egypt
A Special Case Study Evaluation

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These Views Represent those of the Author and Not Necessarily those of the Funding Agency
APPROACHES TO APPROPRIATE AGRICULTURAL TECHNOLOGY (AAT) IN EGYPT: A SPECIAL CASE STUDY EVALUATION

PURPOSE

The purpose of this study is to evaluate approaches to appropriate agricultural technology as they relate to particular conditions and constraints in Egypt. Within this context, the report examines the evaluation of an AID approach to AAT through the comparison of successful predecessor projects in Turkey and Pakistan and the culmination of this effort in Egypt through the Small Scale Agricultural Activities Project (SSAA).

METHODS:

This study began in AID/Washington with a review of appropriate technology (AT) literature and AID documents concerning predecessor projects in Turkey and Pakistan. Extensive telephone interviews were conducted with retired AID project officer, Marvin Parker, one of the key personalities involved in these projects.

During a one month TDY in Egypt, interviews were conducted with GOE officials, USAID personnel, AID contractors, employees of Egyptian research and development (R & D) institutes, PVO project officers, private and public manufacturers and farmers. Field visits account for approximately 50% of this time.

INTRODUCTION:

Situated between strong farmer ties to traditional practices and new GOE directives for major agricultural mechanization, appropriate agricultural technology has had a slow beginning in Egypt. In light of successful AT projects in other developing countries and the successful, albeit limited efforts of individual groups in Egypt, one must ask what conditions and constraints have prevented the implementation of new technologies and agricultural practices in this country? In order to answer this question, the report begins by examining the reasons for the success of AID predecessor projects in Turkey and Pakistan. Through comparison of these experiences and the positive efforts efforts of on-going activities in Egypt, points
of commonality can be drawn to form a generalized approach to appropriate agricultural technology.

The second section analyzes Egyptian agricultural needs to determine which technologies are the most appropriate. Particular attention is paid to the needs for mechanization as they relate to a changing situation in the rural labor force.

The third section examines preconditions for the expansion of AAT efforts in Egypt including: (1) the willingness on the part of the GOE, development planners and farmers to accept and promote new innovations and (2) the availability of effective research and development institutions, manufacturers and extensions.

The last section of this report evaluates AID's efforts to implement and institutionalize AT in Egypt through the Small Scale Agricultural Activities Project (SSAA). Particular attention will be paid to the adherence of this project to an appropriate process for adapting technologies and possible areas for improvement in these areas. Finally, conclusions will be drawn about the implementation of AT as they pertain to the particular needs and conditions in Egypt.
لا يمكنني قراءة النص العربي من الصورة المقدمة.
وأخيراً فإن مجموعة أفراد الدـ (جمعيات خيرية) والجامعات والهيئات الحكومية بـ
القدرة على توحيد هذه الجهود.

ولكن تخف بعض العقبات في طريق تنفيذ هذه العملية ويجب أن تقوم مراكز البحوث بمسـ
اتصال جيد مع الصناعين والتوسع، وبالتالي فإن الصناعين في حاجة إلى ساعدة فنية ضخمة
من هيئة التخطيط والتنمية لتنمية النماذج الأصلية ونتائج النماذج الأعالي.

وأخيراً فإن الدـ (جمعيات خيرية) والجامعات والهيئات الحكومية في حاجة إلى دعم
مالي وقافي للمحافظة على جهودهم.

وينبغي أن تكون هذه الصناعات الفنية الزراعية بدروها تعزيز نماذج التوسع الموجود بالإضافة إلى تعزيز
هيئة حكومية هدفها المشروعات التكنولوجية المناسبة والتعاون القوي ضرورة لإدخال هذه
التيكولوجيا بشكل جاد.

وينبغي أن تتمثل كذالك الصناعات الفنية الزراعية في استثمار الدعم الميكانيكي للعوامل
الريفي، حيث لا يكون العمل الزراعي هو الصدر الأساسي للدخل، والصناعات الريفية
العملية جيدة يجب أن تكون الدعامة الثانية للتنمية الريفية بعد الحركة الزراعية.

والفشل في اتخاذ هذه الأعمال قد يكون له نتيجة سلبية خطيرة على توازن الريف.

وبل ذلك في الأهمية ضرورة ادخال تكنولوجيا بديلة لتنمية الصناعات البديلة المضخمة الغير
مستغلة (الخالية) للحاصر ولاحتياجات المستقبل في مصر.

مشروع المشروعات الزراعية الصغرى يمكن أن يلعب دوراً هاماً في بداية برامج التنمية هـذا.
والدعم المادي والمساعدة الفنية هما العنصرين الأكبر احتياجبا كحافز لتنفيذ التكنولوجيا الزراعية
المناسبة وعلاهما مخطط له في تصميم المشروع.

والعناصر الميكانيكية لهذه المشروع يجب أن تكون تحت اشراف مشروع الحركة الزراعية الرئيسي.

والمشروعات الفرعية الصناعية والتقنية المبتكرة البديلة يجب أن تبقى مستقلة.

وصلاً لهذه المكتبة الزراعية هائلة ولكن بها بعض المشكلات الزراعية الهامة، والحركة الزراعية
بمساعدة التكنولوجيا المناسبة هي إجابة لواحد من هذه المشكلات.
تنمية المناعات الريفية البسيطة هي جزء ثانٍ لهذا الحل وإذا أمكن عمل ربط جيد بين النضج وتخفيف هذه المستحثات وإذا توفر المساعدة الفنية عن طريق وكالة الإضاءة الأمريكية والمنظمات والحكومات الصربية، يمكن أن تصبح التكنولوجيا الزراعية المناسبة حجر الزاوية لتنمية الزراعة الحضرية والمناطق الريفية.
SUMMARY

A labor shortage exists in Egypt, but not one that can be witnessed in the city streets, government ministries or even provincial centers. It is a shortage of wage laborers during peak harvest seasons in the countryside. Most farmers' lives are difficult, their work exhausting and the financial rewards are slim. Even if agricultural pricing policies changed and land owners could offer higher wages, it does not necessarily follow that more people would accept the work. A large percentage of youth from the countryside are choosing jobs in the city, opting for government employment or heading to other Arab countries for higher wages. As a result, delays in harvesting and planting occur, often beyond optimum seasons. The consequence of these delays can be disastrous for production levels.

One obvious conclusion is that agriculture must be mechanized. Existing tractors should be repaired and new ones have to be imported unless local production can be established. The second conclusion is that new farm implements and tractor attachments should be developed as fast as possible to compliment these efforts in tractor mechanization. As lands become more consolidated, at least in production if not in ownership, new machines and processes will be required to fill the labor gap.

Egypt has the choice: it can produce some of these new technologies locally or it can import them. Obviously local production is preferable. The availability of a well-developed group of institutions working in agricultural and industrial research and development can play an important role in choosing, adapting and developing appropriate technologies to address these needs. Likewise, the strength of the manufacturing sector in their resourcefulness with limited materials and facilities, could serve well in the production of new machines. Finally, a few individuals, PVOS, universities and government institutions have the capacity to coordinate these efforts.

Only a few obstacles stand in the way of this implementation process: R&D groups need to establish better links with manufacturers and extension agencies. In turn, the manufacturers require substantial technical assistance from research and development experts to manufacture initial prototypes and to produce the first models. Finally, the PVOS, universities and government
institutions need financial and technical support to maintain their efforts.

The GOE, for its part, should try to strengthen the existing extension system in addition to identifying one government institute for the focus of appropriate technology projects. National coordination is a must if these technologies are to be introduced in any serious manner.

Cottage and agro-industries need to be developed as well. These will form the support mechanism for rural families when farm labor is no longer the principal source of income. Properly developed rural industries should become the second pillar for rural development after farm mechanization. A failure to establish these businesses could have serious negative implications for equity in the countryside.

Of secondary importance, alternative technologies should be introduced to develop enormous untapped renewable natural resources for present and future energy needs in Egypt.

The Small Scale Agricultural Activities Project could play a major role in the initiation of this development program. Financial support and technical assistance are the two components most needed as a catalyst for the implementation of appropriate agricultural technology. Both of these are planned inputs of the project design. The mechanical aspects of this project should come under the supervision of the Major Agricultural Mechanization Project. The non-hardware, industrial and alternative technology subprojects should remain independent.

Egypt has tremendous agricultural possibilities. It also has some major agricultural problems. Agricultural mechanization with the assistance of appropriate technologies is one answer to these problems. The development of cottage and agro-industries is a second part of that solution. If the proper links can be established between development and implementation of these innovations, and if technical assistance is made available through the help of AID and GOE organizations, appropriate agricultural technology could become a cornerstone for the development of Egyptian agriculture and rural areas.
SECTION I. BACKGROUND CASE STUDIES

A. Successful USAID AAT Development Projects in Turkey & Pakistan

(1) Turkey - On-farm Water Development Project, 426

This project, managed by Marvin Parker, offered a new approach for AID and the GOT to address agricultural development needs. In 1968, a Participating Agency Services Agreement Team (PASA) and the General Directorate of Soil Conservation and Farm Irrigation (TOPRAKSU), under the Turkish Ministry of Village Affairs, identified a need for land-levelling to improve water use efficiency and to pave the way for additional agricultural mechanization. During this period Turkey was experiencing a rapid transition from animal power to tractor power; over 75,000 privately owned tractors were in use. The effective employment of farm implements and particularly tractor attachments lagged behind these developments. Accordingly, the project undertook to design, adapt, develop and introduce tractor attachments to address the need for land-levelling and other agricultural processes. The essential project components consisted of the identification of the problem and the implementation of a plan which incorporated technical assistance in the development of new farm implements using small local manufacturers and available local resources. As a result, today several new tractor attachments and farm tools are being used extensively throughout Turkey. Furthermore, the process initiated by the project has been at least partially institutionalized through the continuing efforts of trained counterparts in TOPRAKSU and with the expanding production of these new implements by local manufacturers.

According to Parker, six areas of technical assistance were crucial to the success of this project:

- in the selection of equipment
- in the evaluation of the needs and in the recommendation of new designs for equipment which were adaptable to Turkish farming and manufacturing,
- in making modifications to existing farm tools,
- in assisting local manufacturers with production of prototypes of new designs and modification of existing tools,
- in assisting in training programs for government personnel and private operators in the proper operation, maintenance and repair of equipment,
- in assisting local manufacturers in the development of effective sales and service programs for the new and improve implements.

Parker stresses that the key to success with new or improved farm implements lies in the proper selection and production of prototypes. In this regard, he emphasizes that new prototypes must promise significantly improve performance and efficiency over existing equipment, must be relatively simple in design to reduce the risk of failure and the need for extensive training, and must be easy and economical to manufacture.

It is worth noting that the cost of development of these new technologies was nominal. In the case of prototype development and production three kinds of financial support were provided: direct support for the fabrication of first models for the purchase of construction materials and services, firm orders for a number of finished implements and the use of a small revolving fund for incidental expenses connected with the developing and testing of new ideas.

In all cases technical assistance, not money, was more important for success. Parker provided the majority of this technical support.

(2) Pakistan - On Farm Water Management Project

In Pakistan, as in Turkey, precision land-levelling was identified as a primary agricultural need. Being aware of the successes of the land-levelling tractor attachment developed by Marvin Parker in Turkey, it was suggested that the machine be used in Pakistan to address the same problem. Niel Dimick provided technical assistance to several large manufacturers without giving any financial support. Two groups successfully reproduced the machine and the first ten were sold to fairly large farmers. Several years later small workshops began copying the idea, one of which grew to become one of the largest farm machinery shops in Turkey.
In the case of Pakistan, a well developed new farm implement, the land-leveler, was imported with the intention of developing local production. Once the need had been identified and the proper technology selected, the only additional requirements were the loan of a prototype and technical assistance to make simple modifications on production and use. The idea was again successful.

B. Developments in Appropriate Agricultural Technology in Egypt

Efforts to promote AAT in Egypt can be divided into three major groupings: the appropriate technologies which have already been accepted, R & D efforts which are underway, and the "grass-roots" approach of PVO's to introduce new technologies and rural industries.

Several positive steps have been made in the field of R & D for technological innovations. A number of governmental institutes and university departments have identified crucial needs in agriculture and are presently exploring possible solutions. In some cases models and prototypes have been built for which preliminary tests look promising. However, in the majority of cases, tests have not been performed under real conditions and the ultimate "appropriateness" of these technologies remain unclear.

Several experiments have been conducted with alternative technologies including solar (thermal and photovoltaic), wind and biogas. In each case successful models have been built with significant financial support and technical assistance from foreign donors. Each of these showed great promise for the future, unfortunately, attempts to extend these innovations have been frustrated by existing governmental price subsidies on energy which work to their disadvantage.

The manufacturing sector, both private and public, has indicated innovations on its own. These include improvements on existing farm implements and the adoption of imported technologies for local production. Several new tractor attachments are now being produced locally. In some cases technical assistance provided by expatriate personnel of donor agencies and PVO's has been the catalyst for these developments. In other cases clever machinists have made their own improvements.
The third group actively involved in the development of AAT in Egypt is the PVO. The general emphasis of their activities is rural development including the promotion of cottage industries and the development of new technologies. Projects have been undertaken in fishfarming, honey and poultry production, woodworking and silk production, to name a few. Technical assistance and credit arrangements have been necessary components in the establishment of these industries, but their economic viability is proven through continuing operations.

Unfortunately, only a handful of new implements are in use, most R & D never leaves the development stage and only a limited number of PVO's work in the field of AT. Little has changed in the life styles and agricultural practices of the farmers in Egypt. Over the past 20 to 30 years, the only apparent innovations are in the use of tractors, the introduction of the drum-thresher, the now extensive use of diesel water pumps for irrigation and the development of a few tractor attachments.

(1) Catholic Relief Services (CRS), Butch Baghat and the Thresher-Winnowing Machine

The best example of the adoption and implementation of AAT in Egypt is the thresher-winnowing machine promoted by Butch Baghat through CRS. Sustained efforts in development, testing and extension over the last 10 years have produced a machine that addresses local needs. The 10hp diesel engine which runs the machine must be imported, but serves the dual function of powering the thresher and a water pump during non-harvest seasons. The slightly complex nature of the machine necessitates substantial technical assistance in its manufacture and use. For this, CRS has developed a small extension team to monitor operations and train local workshops in repair and maintenance. The local Development Banks warehouse the machines and provide credit for sales.

Although only 100 threshers are in use to date, the planning and careful approach being used promises to be successful. Mr Baghat and CRS hope to reach a "critical mass" of 400 operating machines at which point it is expected the market system will take over. Furthermore, preliminary discussions have begun between German and Egyptian manufacturers for the production of the required diesel engine in Egypt.

The success of this project is a result of the approach used and the continuing support of donor agencies and PVO's. In
1973, under the auspices of the Ford Foundation, Baghat imported an International Rice Research Institute (IRRI) rice thresher to Egypt for adaptation. The main objective of this effort was to attempt to shorten the time required between harvesting and planting through improved mechanical threshing; (hand threshing and winnowing take several days per feddan depending on the crop, and the use of tractors to power drum threshers is inefficient causing delays in field preparation for the next crops). Initially two prototypes were made for wheat and sorghum threshing and winnowing. One remained in the field for testing while modifications were made on the other. When testing was completed, Behara, a large public manufacturer, agreed to build the first models. Delays and inefficiencies in production necessitated changing manufacturers. Another government company was located which has successfully produced the existing models with only minor problems in precision.

C. An Approach to the Introduction of AAT

From the successes of Marvin Parker in Turkey and the positive experiences of others in Pakistan and Egypt, certain points of commonality can be drawn to form a generalized approach to AT. The steps involved in this approach include: the identification of a need, the selection of a technology to address that need, the development/adaptation of a prototype, proper testing, modifying the prototype and extension to the manufacturers and end-users. An elaboration of these points follows:

1. Identification of the Needs: A recent conference in Sweden on AT concluded that the world has created many AT solutions, but it has failed to first identify the needs being addressed. Unfortunately, most efforts in AT have developed inappropriate prototypes before conducting proper studies into the socio-economic problems involved. The general result is a stockpile of AT museum pieces, which will never be applied as intended. The needs of agriculture and industry must be defined before technological solutions can be developed. Although fundamental to this process, the preliminary step of need identification has been frequently ignored.

2. Research and Development: The selection of a technology to address a particular agricultural problem, and the development/adaptation of a prototype are the responsibility of
individuals, institutes and universities involved in R & D. Few technologies can be transferred from one environment to another without being adapted to local conditions. This step requires trained technical personnel, an understanding of the problem being addressed and adequate financial support.

3. Prototype Production: Prototypes must be developed which fit the technical capabilities of the manufacturers intended to produce them. The quality of the construction of the initial models will be an important factor in the ability of others to reproduce it. For universities, research institutes and government ministries, which have their own production facilities, prototype production can play an important role in the development of mechanical skills within their workshops. As an alternative, public and private workshops, both large and small, can build prototypes for groups who provide the necessary technical assistance. In both cases, quality control must be maintained through the direct supervision of the engineers involved in the R & D stage.

(4) Testing of the Prototype: The testing location must be determined by its appropriateness to the problems being addressed. New harvesting techniques which require mechanical seed bed preparation will obviously require the use of an experimental farm or agricultural testing station for trials and demonstrations. A new biogas machine needs highly controlled test sites until that technology is better understood by eventual users. A new threshing machine, on the other hand, cannot be properly tested and evaluated unless tested in real rural conditions. Final trials, in any case, should occur in the field before the acceptability of the technology can be proven.

(5) Modifications: After each trial, until the technology has been accepted, modifications in design and operation are often needed. Commonly, problems arise in the field which cannot be anticipated under ideal conditions or through controlled experiments and no large-scale production should begin before the required modifications have been completed.

(6) Extension: Extension needs to be applied to both the manufacturers of these technologies and the end-users, be they farmers or entrepreneurs of agro-industries. All groups
need information about the availability of new technologies, credit for construction or purchase of these innovations and technical assistance for their manufacture and use.
SECTION II. THE DEFINITION OF AGRICULTURAL NEEDS FOR TECHNOLOGY

An examination of Egyptian agricultural conditions indicates a need for major agricultural mechanization and the development of rural-based cottage and agro-industries. A secondary concern exists in the area of alternative technologies to answer present and future energy requirements.

(1) Mechanization

The need for agricultural mechanization is paramount. In recent years, a diminishing number of farmers have been expected to maintain increasing levels of production in a situation where land and water are constrained and no base of mechanization has been established. The combined impact of rural to urban migration, attrition from agricultural employment to public sector jobs and the out-migration to other Arab countries has raised rural labor costs, created a scarcity of workers, and caused delays in harvesting, threshing, cultivation and planting during the two peak harvest seasons. This seasonal labor shortage has been exacerbated by the continuing high levels of out-migration. This situation could change as new energy sources are substituted for petroleum and this demand for labor diminishes in the Arab Countries. However, when these changes occur and how much they will effect Egyptian laborers remain unclear. In 1978-79, rural wages were generally as low as LE 1-2/day. Today wage laborers are only willing to work for LE 3-4/day depending on the task. Some jobs, such as hand-winnowing, are so tedious and physically discomforting that laborers even refuse the work. As a result of this shortage, farmers harvest slower, clear their fields later, cultivate with delays and ultimately plant crops beyond optimum planting times. In parts of Upper Egypt where the labor shortage is most acute, the entire crop cycles can be as much as three weeks off schedule.

The lengthened periods during which crops remain unharvested and fields lay fallow have a negative impact on production levels. Furthermore, children, who presently comprise 25% of the agricultural labor force, are used increasingly to fill this gap.

To date, few measures have been taken to compensate farmers for additional labor expenses and little has been done to increase agricultural mechanization. There are approximately 35,000 tractors in Egypt, many of which are no longer in operation. Few tractor implements have been introduced and tractors are often employed
inefficiently to power drum threshers and water pumps when they are needed for field preparation.

It could be argued that deregulation of farm prices would provide the financial surplus necessary to pay higher labor costs and discourage out-migration. However, there is little reason to believe that price policies will be changed in the near future. Consequently, solutions to this problem must reflect existing relative prices and scarcities.

A major push in tractor mechanization is needed to increase agricultural production levels and solve the growing problem of seasonal labor shortages. Consequently, the development and introduction of labor-saving implements should be the primary concern of AT mechanization in Egypt. These should include tractor attachments and independently powered machines for threshing, harvesting, irrigation and other processes.

(2) Cottage and Agro-Industries

Cottage and agro-industries need to be developed as a compliment to agricultural production and as a stimulus to off-season rural employment generation. A whole range of secondary agricultural industries could be developed in food processing, packaging and marketing to improve the rural economic base. Likewise, animal husbandry, honey and silk production and other cottage industries could provide employment opportunities for large numbers of rural residents who remain largely underemployed during non-harvest seasons. The development of these industries using AT should create a balanced rural development program along with the mechanization of production.

(3) Alternative Technologies

Alternative technologies are the way of the future, particularly in Egypt. In light of the consistent levels of solar intensity, the nearly uninterrupted prevailing northerly winds which run the course of the Nile, and the untapped resources available for biogas, Egypt is an ideal location for both experimentation and use of new energy-saving technologies.
SECTION III. PRECONDITIONS FOR THE EXPANSION OF AAT EFFORTS IN EGYPT

A. Attitudes of the Participants

(1) The GOE and MOA Attitudes

High level GOE officials have a clear understanding of the needs for new technologies in Egypt, but have some reservations about the use of AT. Most of these reservations arise out of a misunderstanding about the definition of AT. Typically, GOE officials view AT as an attempt to keep technology simple and labor intensive. To them, this represents a "second-best" solution to their development needs which will impede more rapid technological advances. The many years of restrictions on technological imports under Nasser's "Arab-socialism", and the consequent delays in development have reinforced this viewpoint. These sensitivities bias government efforts towards large-scale "modern" approaches to development which in turn are easier to administer.

Peter Askins, a supporter of large-scale technology, defends this outlook arguing that labor is neither as available nor as inexpensive in developing countries as outsiders imagine, and that the scarcity of talented entrepreneurs and managers demands efficient, centralized use of these human resources. If one accepts his criticism, the result should be the use of technologies which are generally larger and more capital-intensive than implied by most definitions of "appropriate" (technologies).

(2) Western Development Planners (USAID, PVOs & Theoreticians)

The outlook of most western development planners is prejudiced by a preoccupation with rural-unemployment and equity concerns. Continual reference to rural employment generation and underemployment in development literature bears witness to this bias. While the problem of unemployment may be paramount to large portions of the developing world and to several sectors in Egypt, generalization of this concern to all countries and sectors within these countries is inappropriate. The suggested application of labor-intensive technologies presupposes a labor surplus which does not exist in the Egyptian agricultural sector. Although employment generation remains critical to economic growth in urban areas, the agricultural labor force in Egypt is diminishing. This employment generation bias adversely affects the attitudes of the GOE towards AT.
The evolution of the concept of AT is responsible for both Western development planner biases and developing country misconceptions about AT. Few areas in recent development studies have attracted so much attention and controversy as this issue.

Little consensus exists concerning either the proper label for these technologies or their definition. Ernest F. Schumacher, considered by many the father of this new development approach, introduced the concept under the label of intermediate technologies in his book *Small is Beautiful: Economics as if People Mattered* (1973). Schumacher stressed the need to promote decentralized, self-sufficient community units employing technologies which conserve capital, operate on a small-scale and generate employment. Other theoreticians in this field have offered slightly different variations on this theme. The "back-to-basics" groups propose the doctrine of alternative technologies advocating the use of renewable energy resources for self-sufficient development. Groups principally concerned with high levels of rural to urban migration in the developing countries and the pressures of rapid population growth emphasize rural employment generation as the main goal of the introduction of these technologies. Finally, those most interested in the issue of equity view AT as the vehicle for a better distribution of wealth and improvement in the standard of living for the world's poor.

In each case these definitions are more appropriate to the interests of the developer than the environment being developed. Each of these approaches unnecessarily limits options for AT: Schumacher defined AT in terms of size, the "back-to-basics" groups with the use of local resources only and, those interested in equity stipulating who were to be the beneficiaries. The approach used to determine what constitutes AT, deserves more attention than the limitations some definitions place on the size and power of AT machines. Likewise, preconceived notions of how large the landholdings of target beneficiaries should be, improperly limit the technological choices required to solve some larger development concerns. Finally, AT may not be the best area for the application of equity concerns. In order to reinforce positive benefits of AT, the definition of these technologies and beneficiary groups must be determined by the problems and conditions of the particular country.
AT is "the process of arriving at the most economical and socially acceptable mix of existing local resources to meet a development need". This definition avoids placing size restrictions on the technology developed, it identifies beneficiary groups according to need and it addresses equity concerns only as they apply."

(3) Farmer Receptivity

Egyptian peasants are very traditional and often suspicious of change. They have used the same agricultural practices for centuries. Only proven technologies have been well received in the countryside, and these only after showing obvious benefits over the use of existing tools and practices.

Farmers have the ability to analyze their own problems and the communities have hidden resources to implement solutions, but major efforts in education, extension and decentralization are needed as the catalyst to activate these strengths.

B. Availability of the Necessary Components for the Implementation of AAT in Egypt

(1) Research and Development

As mentioned above, several universities, government institutes and individuals are presently conducting valuable R & D in Egypt. Unfortunately, most of these projects have yet to leave the design stage as a result of three primary weaknesses in their organization. Firstly, there is a lack of direction from the GOE concerning priorities in research. Secondly, all of the above groups lack financial support for their programs. The establish-

ment of properly equipped workshops, the development of facilities for training programs and the provision of incentives required to stimulate these activities are all dependent on the availability of funding. Finally, strong links need to be established between R & D groups and the farmers and manufacturers they are intended to help. The fulfillment of these needs would create a strong capacity in Egypt for the adaptation and development of AAT.

(2) Manufacturing Conditions, Public and Private

No locally produced appropriate technologies can be introduced or adapted without the full cooperation of the manufacturing sector. In Egypt, the public and private sector manufacturers operate in parallel with different strengths and weaknesses. The assets of each sector should be exploited for the successful application of new technologies.

Several large, semi-governmental industries build the majority of domestically produced farm machines. The technology involved is relatively simple, necessitated by a lack of efficiency and precision generally characteristic of the Egyptian public sector. The smaller, private workshops tend to copy already established designs which they build with varying degrees of quality control. It is of interest to note that the few private shops which specialize in precision operations have more work than they can handle and appear to be making large profits. Most of the small shops specialize in the production and repair of a particular type of tool or tractor attachment.

Both sectors produce tractor parts and attachments, trailers, threshing machines, small farm implements and irrigation equipment. Almost all motors for these machines are imported and to date no successful tractor has been developed in Egypt.

The adaptability of these workshops is extraordinary. It seems as if no repair work is beyond the resourcefulness of the machinists. The years of import restrictions and a lack of spare parts have contributed to the development of this sectoral strength.

However, the general lack of mechanization in Egypt has left this sector suffering from unemployment and underemployment, particularly in the rural areas and provincial centers.
The manufacturers need technical assistance and additional credit to become full partners in the introduction of AT. Any new innovations will require continual reworking of designs with a large component of TA. While the larger public and private workshops may be able to bear the expense of this development stage, the smaller workshops will need financial support to reduce risks. Finally, particular attention must be paid in adapting these technologies, whenever possible, to the limitations of small-scale production facilities.

The entire process of agricultural mechanization and the implementation of AT in Egypt depends on the development of both private and public industries. Efficiency and precision need to be improved through education, training and extension, all of which include technical assistance. Individual cases where agricultural engineers have worked hand-in-hand with producers have proven very satisfactory. Now these efforts must go beyond the individual level.

(3) The Extension Component

Extension rests at the core of all AT issues. Egypt's strengths lie in research and development and in small-scale manufacturing capabilities. Now the links need to be made between the adaption and development of new designs and the production and dispersal of these technologies. No connections exist at present. Extension is needed between the manufacturers and the final users.

Several universities, government ministries and research institutes have designed what appear to be viable prototypes for AT. Testing of these however, has been limited to a few trials on experimental farms and a limited number of brief field demonstrations. Almost no work has been done testing new technology under real farm conditions or involving the ultimate beneficiaries. With regard to manufacturing, some semi-public manufacturers have produced prototypes in limited quantities for R & D institutions, but no mechanism exists for marketing. Consequently, new technologies are never properly tested and production has yet to get off the ground.

The present extension system suffers such weaknesses that extension agents have no access to information on new equipment and in many cases fail to understand either the problems involved
or possible solutions available. The lack of links between research and development and manufacturing is aggravated by the absence of a functioning extension system to farmers. Too often the present extension structure serves as a regulatory agency for crop production instead of operating as a service to farmers.

The present effort of AID and others to strengthen extension only provides a temporary solution to the larger problem on a piece-meal basis. An effort should be made to tie the extension elements of these separate agricultural projects together in the formation of a cohesive extension program. Hopefully, the forthcoming Bifad and World Bank studies can provide a greater source of direction in this regard. Furthermore, one institute within the Ministry of Agriculture should be identified to coordinate extension work. Such a locus for the program would provide strong support for related development objectives e.g. the introduction of appropriate technology. Without proper extension work AT can never be implemented.

In this regard, the clear understanding of the Agricultural Research Center in new extension techniques deserves close examination. The Development Bank shows similar strengths in the provision of rural credit for new purchases; all new farm machines being promoted by various manufacturers and the MOA are warehoused and displayed through local Development Banks which suggests that this link should be reinforced as a temporary marketing component for new technologies until the private sector takes over. A strong, consolidated extension service operating in coordination with the Development Banks could deliver both the knowledge and the machinery to the farmers.
SECTION IV. EVALUATION OF THE SMALL-SCALE AGRICULTURAL ACTIVITIES PROJECT (SSAA)

The findings of this study support the soundness of the objectives established by SSAA project for the implementation of appropriate agricultural technology in Egypt. The log frame, as follows, corresponds directly with the suggested approach presented above:

Log Frame:

1. **Goal:** "An improved quality of life for rural families and the increased participation by small entrepreneurs in national economic development".

2. **Purposes**
   - to introduce and/or adapt technologies appropriate to small farmers and rural resident needs.
   - to begin the process of developing an institutional capability in appropriate technology.
   - to increase rural employment opportunities through expansion of small rural-based agribusiness enterprises.

The project paper specifies that basic technologies are to be adapted for use in Egypt, "as distinguished from inventing or reinventing the same technology in Egypt." Likewise, it is stated clearly that, "manufacture will be performed by small shops located in rural areas." Nevertheless, certain liberties need to be taken with regard to the direct use of rural manufacturers and concerning the immediate extension of these technologies to a large number of farmers. Both objectives require more time than is provided for in the project design.

3. **Outputs**
   - "items or processes of appropriate technology introduced, adapted to Egyptian conditions and in use in rural areas. It is expected that at least ten adaptive equipment items or systems will be extended in the rural sector."
   - "trained counterpart and cooperating agency personnel."
- "training and extension programs directed at local manufacturers of equipment items and small farmer-users of the items or processes.... The project target is to reach 500 farmers and a minimum of 2 manufacturers with each adapted idea."

- "instructional materials for both extension personnel and technology users."

- "data and information on the process of how items of appropriate technology are introduced successfully in Egypt."

4. Inputs

The inputs necessary to achieve the above outputs are technical assistance, commodities, staff, facilities, training and appropriate technology adaption/extension funds. Total cost will be $2.1 million of which $1.7 million is the AID input and $400,000 is the estimated contribution of the ARE. These costs, excluding inflation and contingency, are divided among the outputs as follows:

(a) Prototype Solutions:

"From AID funding $204,000 of the amount allocated to technical assistance, $41,000 of the commodities including both prototype and project support types, and $100,000 of the equipment development and extension funds will be devoted to developing prototype solutions. The ARE input will be primarily time and facilities provided by staff, manufacturers and farmers. The estimated value is $80,000."

(b) Trained Counterpart and Cooperating Agency Personnel:

"The AID inputs will consist of training funds ($100,000), technical assistance ($61,000) and commodities ($7,000). The ARE will provide personnel for training and to serve as counterparts and project staff. The estimated value is $40,000."

(c) Training and Extension Programs:

"Technical assistance valued at $81,000 (6 long-term and 3 short-term months), equipment development and demonstration funds of $500,000 and commodities valued at $5,000 will be AID inputs. The ARE contribution will consist of personnel,
operating costs and use of facilities in demonstration areas and at training sites. These have an estimated value of $150,000."

(d) Instructional Materials:

"AID will fund commodities valued at $15,000, technical assistance valued at $20,000 and provide $100,000 from development and extension funds. The estimated ARE input of personnel, operating supplies and facilities is $30,000."

(e) Data and Information:

"The amount budgeted for evaluations and studies of the process of technology adoption is $30,000. No specific ARE input to this out is projected.

Methods:

It is the plan of the project paper that problems for the attention of the SSAA project would come from a variety of sources including: small farmers, ARE agricultural production or service organizations, voluntary agency personnel or staff working on other USAID-supported projects. The Appropriate Technology Task Force (ATTF) was established to review project proposals to determine their suitability for project assistance. The final authority for acceptance is vested in a three-man technical committee composed of the senior Egyptian staff member of the ATTF, a representative of the MOA and an AID-funded project technician.

Based on an approved solution development plan, proposed work on these problems will be performed by project staff and outside groups or individuals. In-shop and on-farm development work will be emphasized. Extension of adapted items will be carried out in only selected locations primarily by non-project personnel, but utilizing project funds under project staff overall direction.

The project paper specifies that, "in all cases it is expected that the process of developing a solution and adapting a technology to a specific problem will be carried out to the maximum extent possible utilizing small shops and intensive on-site testing." The project paper continues that, "only when this item or process is accepted by the end-user will it be judged ready for wider extension".
Present Status of the SSAA Project

The implementation of the SSAA has evolved into two very distinct activities: (1) the in-house development of mechanical prototypes and (2) the support of alternative technologies and agro-industries through diversified agencies and institutions. The first activity involves the extensive use of a MOA workshop for the adaption, development and production of prototype designs under the direct supervision of the project director. Most of these prototypes remain in the development stage and little effort has been made to promote the development of appropriate hardware technology by other concerned agencies or institutions.

Under the non-mechanical activities, several approved subprojects are managed by outside institutions, using rural settings for the development, testing and introduction of new technologies and agro and cottage industries.

Several viable activities have been undertaken by both the mechanical and non-mechanical sides of this project. Under the supervision of the Project Director, Dr. Nabil El Awady, and through the efforts of the MOA workshop, several new mechanical prototypes have been adapted or developed. These include an experimental small tractor, a tood carrier, a small rice seed-drill and a self-propelled field sprayer. On the non-mechanical side, subprojects are underway in manufacturing beehives, irrigation technology, pest control (rat & insect), solar fruit drying and new fruit and vegetable packaging boxes. Several other subprojects are pending approval from the ATTF as well. All of these endeavors address important agricultural needs and could serve as "appropriate" solutions to existing problems if the technologies are fully developed, tested and extented to end-users. Identification and use of small rural manufacturers will be as difficult but important step in the implementation of AAT as well.

The project has made some important overseas contacts with other groups working in AT. Dr. Wayne Kroutil, the USAID sponsored contractor and project advisor, should be commended for his efforts in this regard. Learning from the experience of others abroad should be and is an important component of this project. Being aware of the progress of other countries in establishing institutes for AT and AAT should help in project direction for the institutionalization of similar programs in Egypt.
Likewise, Dr. Kroutil's continuing interest in developing an AT library follows the intent of the project design. A home should be found for this library and funds should be made available to support it.

The model workshop was established in the MOA serves several useful functions: it provides a location for training for the mechanics and engineers involved in the project, it provides facilities for universities to develop prototypes in cases where no other workshops have been readily available, and the workshop has been used to produce several in-house subproject prototypes. It should be remembered that the workshop was intended to be used for the adaptation of prototypes, training and extension. Neither the project paper nor the designers of the project meant for this shop to be used for production as is the case under certain project activities. Whenever possible, development, design and especially production are to be done in small rural workshops. Using local manufacturers requires considerable additional time to locate facilities and to develop a working relationship. Nevertheless, rural employment generation is one of the main project purposes and serves as well to test the ultimate feasibility of producing useable new technologies under real manufacturing conditions in Egypt. The extra effort to complete this step is a required component of the SSAA project.

The training of counterparts in the MOA is proceeding as envisioned in the project paper. Several mechanics and engineers are involved in project activities with the hope that they will continue these efforts after the project is completed. The remaining project period should be used to clearly identify individuals who can be used for the institutionalization of AAT within some agencies of the MOA.

Some very positive steps have been taken to begin extension work for new prototypes. An Extension Specialist with the MOA, Mr. Ahmed Mamdouh El Baz, works with the project for the coordination of extension activities. AUS Consultant will be hired shortly for short-term work on industrial extension to manufacturers as well. Because extension plays such a major role in the implementation of the AAT, it should be the first priority for all forthcoming project efforts.

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A few weakness have been identified in the SSAA project; some of these are definitional problems with regard to extension and
implementation of AAT, others are logistical and administrative concerns.

To begin with, no technologies being developed by the project are in use in rural areas with the exception of certain non-mechanical subprojects like beekeeping, irrigation and packaging boxes. The log frame of the project specifies that the first output is "items or processes of AT introduced, adapted to Egyptian conditions and in use in rural areas." If the technologies being introduced are completely developed then manufacturing and extension should follow. The production of prototype is only a step towards full implementation and cannot be considered as the fulfillment of this important project purpose.

Secondly, the final output of this project requires "training and extension programs directed at local manufacturers of equipment items and small farmer-users of the items or processes." The presence of farmers at equipment or demonstrations does not constitute the fulfillment of the project extension requirements. Rather, these displays are a good tool for extension and must be followed through first with extension to manufacturers and then grass-roots extension to the farmers and end-users. It is hoped that any misunderstanding over the definition of extension will be cleared up and that the two aspects of extension (to the manufacturers and the end-users) will continue.

The project paper specifies the use of two manufacturers for each of ten technologies developed, all of which should reach at least 500 farmers. It is an ambition goal, but a necessary one in order to develop a critical mass of items and processes in use. As in the case of the CRS thresher-winnowing machine, the complete implementation of these technologies may take considerable time which will necessitate the continuation of these efforts beyond the project period. The project, therefore, must clearly establish the steps involved to assure this follow through. Little effort has been made to date to contact outside manufacturers except in the case of larger public manufacturers producing project prototypes. Finding small rural manufacturers is the first step in this process.

It is expected as well that third country visits will occur to provide opportunities for the project directors and others to witness the efforts of other nations in AT first hand. So far, only the US project advisor has travelled abroad with the project.

The design of the project intended for the SSAA project to work in close coordination with the other USAID agricultural projects.
Cooperation between members of these projects has been good but the full coordination of efforts has not been forthcoming. Only the Rice Project has worked with SSAA on prototype development of equipment related to its efforts. In part the blame falls on AID not providing better mechanisms for coordination. In fact the contractors and MOA officials are responsible for making these linkages. Regardless, all parties concerned should become more aware of each others' activities in order to benefit from points of commodity. More coordination should occur on extension, equipment development, information gathering, credit and general administration of projects. The SSAA Project should have particularly strong ties with Small Farmer Production for future credit mechanisms, with Major Cereals for extension and testing and with Major Mechanization for a more far-sited approach to mechanical equipment development and extension efforts.

Finally, there seems to be some resistance within the ATTF to fund outside groups, (universities, PVOs and individuals), for both mechanical and non-mechanical subprojects. Attempts to develop 10 or 20 prototypes are not enough to guarantee that at least 10 technologies will be in use by the farmers and produced by 2 local manufacturers each. Too many unanticipatable obstacles could halt the development of a number of these prototypes. Therefore, the use of many participating agencies in the development stages would help guarantee the success of a few new items and processes.

As of May 31, 1981 the MOA only spent LE 21,193 or 2.5% of the funds available for a period that constitutes 42% of the project time. These funds should be allocated to parties outside of the MOA to develop more prototype choices. Prototypes developed by these groups could then be selected for manufacturing and extension once they have been sufficiently well tested. Several universities, government institutes, PVOs and individuals show a readiness to become involved in AAT development if funds are made available. The SSAA project should become the mechanism for this financial support.

In summary, the output requirements are only being partially fulfilled under the present project organization. There is little evidence that the mechanical components of this project are sufficiently well "adapted to Egyptian conditions" to assume that manufacturing and extension will follow. None of the new hardware items are "in use in rural areas". Since introduction and adoption of AT rests at the core of this project, the extension to local manufacturers and small farmer-users can only follow after successful, well-tested technologies are developed.
8. As a service to all agencies and institutions actively involved in AT in Egypt, the ATTF should organize a forum on AT to coordinate efforts and serve as a resource and information center. This could take the form of a conference on AT for all participating groups.

9. Some branch of the MOA or attached institution should be identified as the coordinating, information center for all agricultural AT activities in Egypt. This center could be instrumental in collecting information and in identifying needs for agricultural technology.
V. GENERAL CONCLUSIONS

Appropriate agricultural technology can become an important answer to agricultural development needs in Egypt. The implementation of these technologies is contingent upon the adherence to a proven approach, the proper definition of agricultural needs, the acceptability of the concept and the correction of existing weaknesses in the provision of extension, technical assistance and financial support to the institutions and individuals involved in the process.

From the successes of predecessor AAT projects in Turkey and Pakistan and from the positive experiences of others in Egypt, points of commonality are used to form a generalized approach to AT. The crucial steps involved in this approach include: (1) the identification of an agricultural need, (2) the proper selection of a technology to address that need, (3) the development/adaptation of a prototype, (4) field testing, (5) modifying the prototype whenever necessary; and (6) extension to the manufacturers and end-users. The entire process begins with the definition of agricultural needs. The following four areas have been identified:

- Major agricultural mechanization to increase levels of production and to reduce seasonal labor shortages

- The identification, adaptation and development of a complete range of appropriate tractor attachments and farm implements to increase mechanization and to stimulate the rural manufacturing sector.

- The development of cottage and agro-industries to generate off-season rural employment and stimulate rural economic development

- The development of alternative technologies using solar, wind and biogas power to address present and future energy needs.

In the long run, the application of these technologies and processes will increase agricultural production, raise standards of living, relieve labor shortages during peak harvest seasons, create employment during inactive periods, stimulate the local economy and hopefully address equity concerns.
Acceptance of the concept of AT depends on the use of a broad definition and a long time-frame for implementation. Simply defined, AT is "the process of arriving at the most economical and socially acceptable mix of existing local resources to meet a development need." This definition avoids specifying size-restrictions which limit technological choices and eliminates over-zealous concerns for equity, both of which have been obstacles in the acceptance of the concept by GOE officials.

A far-sighted approach to AT must include a longer time-frame for the acceptability, use and production of new technologies by the smaller farmers and manufacturers. It must be understood that the initial beneficiaries of these technologies will be the established farmers and entrepreneurs who can afford the risks involved. Once technologies have been successfully developed, tested and manufactured on a limited scale, the market system can complete the process of distribution and dispersion to smaller end-users and producers.

Small farmers or entrepreneurs will not become involved in the initial stages of AAT introduction unless financial incentives are high and risks are reduced through sustained technical assistance. Only a few PVOs and small donor projects provide such costly and time-consuming services. Their longer time-frame for generalized acceptance of these innovations and the smaller scale of their operations permit such an approach. Governments, large donor projects and private sector companies rarely show such sensitivities on a large scale.

The final consideration for the implementation of AAT is the availability of groups and individuals to conduct research, develop prototypes and provide technical assistance. In this regard, Egypt's two strengths are in research and development and the availability of resourceful manufacturers. Various universities, government research institutes and individuals are already partners in the development of technological innovations. Likewise, manufacturers, public and private, show an amazing adaptability in the use of their often limited resources.

The two main obstacles in Egypt, for the implementation and institutionalization of AAT, are the weaknesses of the extension service and a related lack of linkages between development, manufacturing and end-users.
AID and other concerned agencies and organization can provide valuable technical assistance to address these problems. The SSAA Project could become the focal point for these activities as they apply to AT. The primary mechanism for this should be through supplying grants to various universities, PVOs and GOE research institutes and by providing technical assistance to these groups during the various stages of AAT development and implementation. If the proper links can be established between development and implementation, and if technical assistance is made available, AAT could become a cornerstone for the development of Egyptian agriculture and rural areas.