

PN-ABK-663

76060

**Opportunities
for Intervention
in Thailand's
Silk Subsector**

GEMINI Working Paper No. 27

GEMINI

**GROWTH and EQUITY through MICROENTERPRISE INVESTMENTS and INSTITUTIONS
7250 Woodmont Avenue, Suite 200, Bethesda, Maryland 20814**

**DEVELOPMENT ALTERNATIVES, INC. • Michigan State University • ACCION International •
Management Systems International, Inc. • Opportunity International • Technoserve • World Education**

Opportunities for Intervention in Thailand's Silk Subsector

by

**Steven Haggblade,
Development Alternatives Inc.**

and

**Nick Ritchie,
CARE Regional Technical Advisor
for Small Economic Activity Development/Asia**

January 1992

This report was prepared for CARE/Thailand. The work was supported by the U. S. Agency for International Development, Bureau for Asia and Private Enterprise, Office of Small, Micro, and Informal Enterprise, through core funding to the Growth and Equity through Microenterprise Investments and Institutions (GEMINI) Project, contract number DHR-5448-C-9080-00.

PREFACE

The Small Economic Activity Development (SEAD) unit of CARE initiated this study as part of its effort to develop effective, low-cost methodologies for evaluating SEAD projects. One option under review is the possible extension of subsector analysis beyond its traditional diagnostic role in targeting small enterprise interventions. The motivation for this attempt stems from the observation that two characteristics of subsector analysis — its search for leverage and its focus on a single activity — lead not only to low-cost interventions but also make subsector analysis potentially attractive as a vehicle for reducing the cost of project monitoring and evaluation.

In brief, the approach being piloted seeks first to identify points in the system at which information on volume can be accurately obtained for a large number of small firms and, second, to compute income from the volume estimates via standard technical coefficients. The SEAD unit has begun to develop this approach along with alternate models for SEAD monitoring and evaluation. Over the next several years, the unit is committed to testing the applicability and cost-effectiveness of alternative evaluation approaches. As a laboratory for piloting the subsector-based option, they have selected Northeast Thailand and CARE's ongoing work with silk producers there. A companion paper by the author (1991) describes the proposed subsector-based monitoring system more fully.

The subsector review presented in this paper was undertaken as a necessary prior step to developing a subsector-based evaluation and monitoring system for the Thai silk project. It proved necessary for two reasons. First, a monitoring system must anticipate the potential interventions it is to track. Second, opportunities for leveraged interventions, identified in the standard subsector analytics, lead also to opportunities for low-cost data collection. These opportunities need to be recognized at the outset as an aid in the design of a streamlined data collection system.

The review was completed within an unusually tight time frame: two weeks in the field and a further two weeks reviewing published material and writing up our findings. Such rapid analysis would not have been possible without CARE's four-year experience in the subsector. We also benefited from recent, valuable in-depth studies funded by the Food and Agriculture Organization and the International Labour Organization (see Prapertchob and Kachamart, 1990; Henle, 1990; and FAO, 1989). In spite of these advantages, long experience suggests that such a short time in the field inevitably leaves gaps in our understanding. Many points still require clarification and elaboration, and inaccuracies of varying magnitudes may have inadvertently crept into our work. In many cases we are aware of the wide discrepancies in published data.

But in our view, even taking the above provisos into consideration, the fundamental trends are clear and uncontested. We emerge encouraged by a promising array of potentially cost-effective, leveraged interventions. That these opportunities can be flagged with modest analytical resources is, we feel, potent testimony to the practicality and utility of subsector analysis.

TABLE OF CONTENTS

	<u>Page</u>
PREFACE	i
EXECUTIVE SUMMARY	vii
WHY SILK?	1
HISTORICAL OVERVIEW	1
DEMAND FOR THAI SILK	2
SUPPLY STRUCTURE	4
Introduction to the Subsector Map	4
Technology	6
Alternate Supply Channels	8
DYNAMICS	12
Driving Forces	12
Ascendant Channels	15
OPPORTUNITIES FOR RURAL HOUSEHOLDS	16
LEVERAGED INTERVENTIONS	17
The Concept of Leverage	17
Subsectors and Leverage	18
Sources of Leverage	18
Potential Leveraged Interventions in Thai Silk	19
Leverage and the CARE Philosophy	21
CONCLUSIONS	22
REFERENCES	23

LIST OF TABLES AND FIGURES

	Page
Table 1. Trends in World Production of Silk, 1938-1985	3
Table 2. Characteristics of Alternative Silkworm Breeds	7
Table 3. Trends in Silk Yarn Production and Imports	10
Table 4. Financial Returns to Household Labor in Alternative Niches	11
Table 5. Trends in International Silk Prices	16
Figure 1. Subsector Map	5

EXECUTIVE SUMMARY

The silk subsector holds enormous promise as a potential engine of income growth for poor village households. But to take advantage of this growth, most producers will have to shift from the low-productivity, low-growth traditional markets to the rapidly growing tourist and export markets. Because large factory weavers and reeling companies dominate these growing segments of the market, the most promising entree into these ascendant channels for households is to specialize as producers of weft yarn, which forms the horizontal weave in fabric, for the weaving factories. This move will require modest advances in technology at all stages in production — introduction of hybrid mulberry, yellow hybrid silkworms, and improved reeling equipment. But by specializing in this way, households can grow in tandem with the modern Thai silk weaving industry and roughly double their labor productivity at the same time.

To facilitate the shift of households to weft yarn production, several promising opportunities appear for leveraged interventions. These include (1) mulberry propagation and distribution through nurseries and commercial farmers, (2) lobbying for reduced subsidies on eggsheets, (3) distributing improved reeling equipment via yarn merchants, (4) information dissemination at assembly points, and (5) developing cocoon drying equipment appropriate for small reeling mills.

In the future, household producers may find that rearing white cocoons offers a second promising niche. Today, however, white cocoons are both expensive and risky. They require considerable investment in land and capital and depend on uncertain government supplies of hybrid eggsheets as well as quota protection from foreign white yarn imports. In terms of technology, the transition to white cocoon rearing represents a logical evolutionary progression from rearing yellow hybrids. But CARE will need to monitor yarn import quotas, weaving industry yarn standards, import prices, and white hybrid cocoon quality to determine where and when it becomes sensible to pursue this second option. Under either option, CARE can play a vital role in this evolution by acting as an informed industry observer and honest broker actively facilitating household access to these promising niches.

Although the proposed interventions will require further review, the array of options suggests that it may well be possible to intervene in ways that will facilitate household access to promising, growing niches. The availability of leverage points offer prospects for cost-effectively assisting tens of thousands of poor households.

WHY SILK?

Historically, silk has provided an important income supplement to low-income households in Northeast Thailand. Of the 360,000 Thai households currently rearing silkworms, over 90 percent reside in the northeast, an impoverished region with sparse rainfall, few natural resources, and limited economic options. Yet its poor soils will sustain the mulberry tree — a silkworm's only diet. Silk production, because of its high labor demand and amenability to household production, is traditionally a female activity. For women with restricted mobility and limited alternatives, it offers a rare opportunity to earn income as well as to meet family needs for silk ceremonial wear.

After a long period of stagnation in the Thai silk weaving industry, a retired American intelligence officer and architect named Jim Thompson almost singlehandedly reinfused growth into the industry, beginning shortly after World War II. By upgrading quality, introducing fashion designs, and careful marketing, he established a distinctive reputation for Thai silk. His efforts benefited from the rapid growth of Thailand as a tourist center and from worldwide silk shortages caused by faltering production in such major producing countries as China and Japan. Today, Thailand's entire complex of weaving, reeling, and rearing industries now employ 500,000 people with sales of 5 billion baht (\$200 million). Industry watchers expect sales to grow at 10 percent or more per year into the 1990s.

This anticipated growth could translate into considerable opportunity for poor village households. Given the current scale of silk production and its geographic concentration, no single activity offers greater prospects for improving welfare across a broad swath of the country's poorest region.

Yet today, unlike 25 years ago, household producers must compete in an environment dominated by large firms of commercial reelers, weaving factories with recently introduced powerlooms, and commercial farmers. Household firms compete with large firms and depend on others for the supply of vital inputs. They also depend on large firms to market their cocoons, yarn, and woven cloth. So although opportunities have increased dramatically, so too have competition and interdependence.

The purpose of this paper is to identify opportunities for poor village households to participate in the anticipated substantial growth in Thai silk. To understand where these prospects are brightest requires first an understanding of how households fit into the interlocking system of silk rearing, reeling, and weaving industries. After identifying niches in which households can be most competitive, the paper proposes interventions that might facilitate their integration into these profitable and growing segments of the silk market.

HISTORICAL OVERVIEW

For thousands of years, rural households across Asia have produced silk using a simple, natural process. It centers around a silkworm, about the size of caterpillar, which subsists on an exclusive diet of mulberry leaves. Twenty days after hatching from its egg, the silkworm spins a cocoon, enveloping itself like a mummy in a single strand of silk thread 400 to 1,300 meters long. In nature, a moth would emerge from the cocoon four to five days later. The females among them would lay eggs to begin the cycle again.

To make silk yarn, the worm must be killed before it can hatch. Otherwise it emerges from the cocoon and breaks the single silk strand into unusable fragments. To kill the worm and soften the natural

gums in the cocoon, village producers place the mature cocoon in a small pot of boiling water. As they reel individual threads up out of the pot, the cocoons unwind like small mummies, and the natural gums, solubilized by boiling water, glue the individual threads together into a single strand of yarn. The thickness of the silk yarn depends on the number of individual cocoon threads it combines. After reeling, the women twist their silk yarn to give it sheen. They then weave the yarn into cloth using a simple village handloom.

Since the early decades of this century, traditional silk production has gradually declined in Thailand. Explosive growth in worldwide production of cheap cotton prints eroded demand for traditional, ceremonial Thai silk, and declining prices dampened incentives in this labor-intensive activity. Stiff competition from Japan and China, which dominate the world silk markets, further eroded crumbling Thai rearing houses.

But a recent renaissance has reinfused growth in this ancient Thai industry. In the late 1940s, Jim Thompson, a former intelligence officer who turned fashion designer, settled in Thailand and began working with local silk weavers. Ultimately, his company based its production facilities in Pakton Chai District of Northeast Thailand. Building on weaving skills prevalent in the district, he redesigned handlooms to increase productivity and upgraded yarn quality by importing improved hybrid silkworms and high tensile strength warp yarn from overseas. He introduced innovative and distinctive fashion designs along with the tight quality control that have made Jim Thompson synonymous with the resurrected, high-quality Thai silk. Today, over 200 weaving firms operate in Pakton Chai, many spun off by former employees and subcontractors who now operate alongside the integrated Jim Thompson complex.

Two sources of growing demand have fueled expansion in Thai silk production over the past 30 years. First is the emergence of Thailand as a major tourist center. By targeting affluent visitors and paying careful attention to image, marketing, and style, Jim Thompson and others have cultivated tourism as an outlet for about three-fourths of the high-quality Thai silk. Second, the newly revitalized Thai silk industry has received a strong assist from the international market. In Japan, for many years the world's largest producer, consumer, and exporter of silk, production has dwindled as labor costs made the industry less competitive (Table 1). The decline in production together with rising domestic consumption has transformed Japan into a net silk importer. China, attempting to fill the gap, stumbled badly following widespread national economic reforms in the mid-1980s, precipitating supply shortages and rising silk yarn prices worldwide through 1989. Swept forward by these twin sources of rising demand, Thai silk production has grown rapidly during the 1980s. Strong demand for Thai silk and steady growth in tourism suggest buoyant demand into the foreseeable future.

DEMAND FOR THAI SILK

Thailand produces silk for three different categories of consumer. First is the traditional demand in Thailand for ceremonial silk wear. Although oldest, this market is now smallest, accounting for roughly 10 percent of total sales. Rural households and older adults constitute the core constituency for traditional sarongs and distinctively styled *matmi* weave.

Tourists and affluent urban Thai consumers, in contrast, purchase the bulk of Thai silk output. Attracted by the high-quality, distinctive image developed by Jim Thompson and competitors, these domestic buyers account for about 75 percent of total sales. They gravitate to one of three weaves that have become synonymous with modern, high-quality Thai silk. One is a greatly improved quality of the

traditional, intricate *matmi* cloth with patterns woven in multicolored threads directly into the weave. Second and largest in the domestic tourist market is printed silk cloth, where, after weaving plain raw silk into cloth, carefully styled designer patterns are impregnated in the fabric. The third segment of the tourist market offers plain bolt cloth with no design, either woven or printed. All three are identified as "Thai silk" by virtue of their production on handlooms with the slightly textured finish characteristic of the hand reeled, traditional silk yarn used in the horizontal, or weft, weave.

Exports account for the remaining 15 percent of sales. Like the domestic market for modern Thai silk, exports include improved *matmi*, printed cloth, and plain bolt cloth. Yet the mix differs, with a growing emphasis on plain bolt cloth. Very recently, Japanese companies have set up powerlooms in Bangkok to weave imported, untextured yarn into perfectly smooth kimono cloth. Because it does not use any Thai silk yarn, has no texture to the weft, and is not produced on handlooms, this segment of production does not qualify as modern Thai silk as defined in the fashion trade. Currently, the powerloom kimono exports account for the bulk of Thailand's silk cloth exports.

TABLE 1
TRENDS IN WORLD PRODUCTION OF SILK, 1938 - 1989
(000 tons)

Country	1938	1970	1975	1980	1985	1989	1989 Share
Japan	43.1	20.5	19.0	15.6	9.6	6.1	10%
China	4.7	11.1	22.1	34.2	36.9	36.0	58%
Thailand	-	-	-	-	1.3	1.5	2.4%
Other Asia	7.0	8.8	9.6	12.5	14.0	18.1	29%
Rest of World	2.5	3.8	4.8	5.3	5.7		
Total	57.5	44.2	55.4	67.6	66.2	61.7	100%

Sources: FAO, *Sericulture Development in Asia*: Bangkok, 1989, p.133; EEC 1991, "Paper to The Seminar on The Development of Silk Production in The Northeast," Bangkok: EEC/MOAC Joint Secretariat Office.

SUPPLY STRUCTURE

Introduction to the Subsector Map

Three closely allied industries — silkworm rearing, reeling, and weaving — operate together to supply silk cloth to their final consumers. A complex network of yarn merchants, traders, retailers, and exporters serve as conduits between households and corporate producers in each industry, channeling inputs and outputs up through a vertical system that culminates in the sale of finished silk cloth. We refer to this network as the Thai silk subsector.

A schematic map — or subsector map, as it is called — offers the quickest and easiest means in manual or subsector analysis of understanding this production/distribution system (Figure 1).¹

Functions

Along its vertical dimension, the map tracks the sequence of functions performed by each industry. Moving from raw materials at the bottom, it traces product flows up through the series of transformations that end with the delivery of silk cloth to its final consumers.

The subsector includes the following major functions: research, mulberry propagation, mulberry production, silkworm egg multiplication, silkworm rearing, cocoon assembly, cocoon drying, yarn reeling, yarn assembly, design, weaving, printing, wholesale/export, and retailing. For convenience, Figure 1 has grouped related functions together so that cloth production includes the weaving industry and allied functions, yarn production encompasses the rearing and reeling industries, and input supply includes mulberry propagation, production, and silkworm egg propagation.

Participants

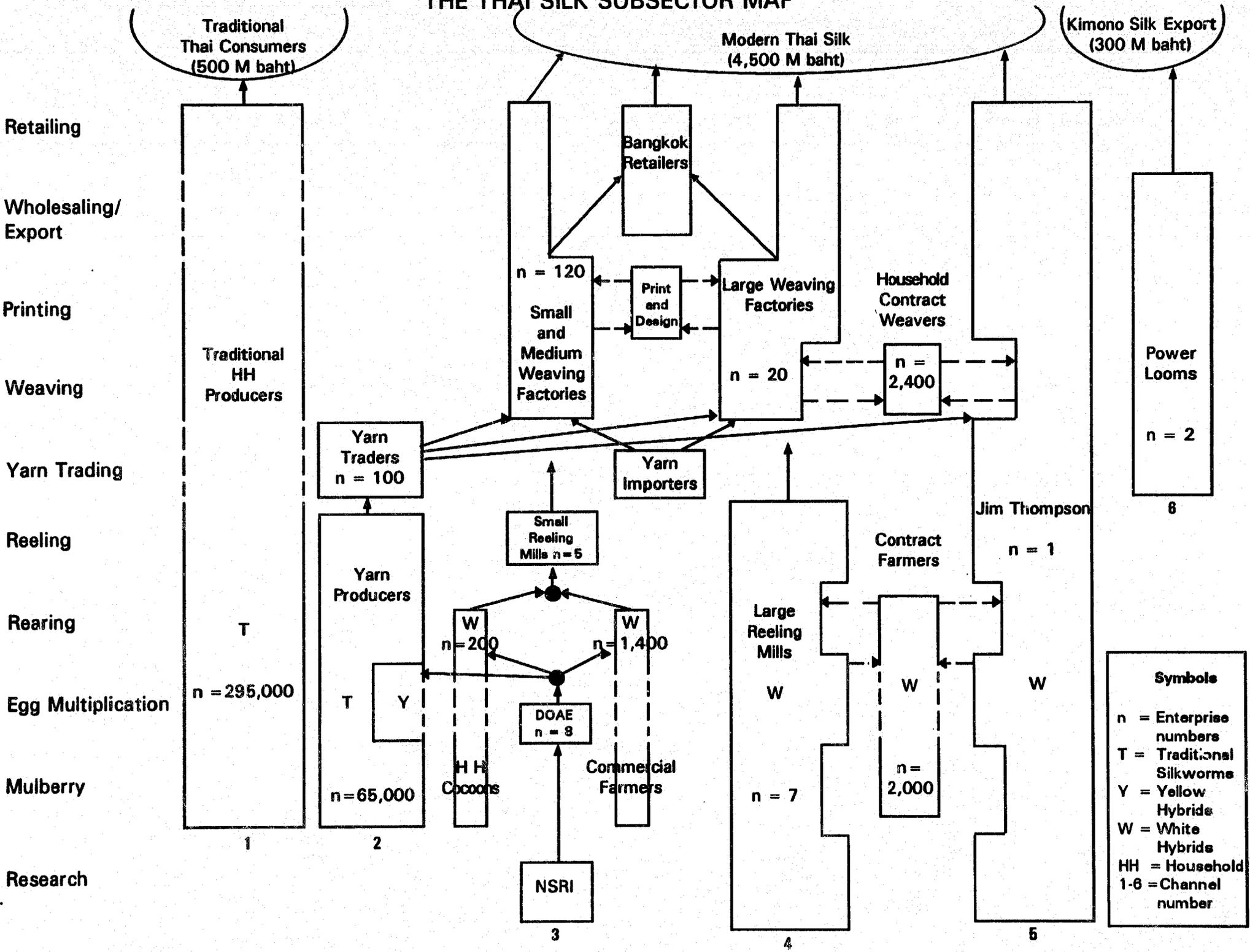
At each vertical level, the map pictures key participants performing that particular function. Starting at the base of the map, we can see that the participants engaged in research include the National Sericulture Research Institute (NSRI) and Jim Thompson. Silkworm egg multiplication is performed by village households, the Department of Agricultural Extension (DOAE), and Jim Thompson. Going still farther up the list of functions, we see that yarn is assembled by yarn merchants, yarn importers, and the ubiquitous Jim Thompson.

Coordinating Mechanisms

Connecting the participants are a series of arrows that trace product flows among firms. Dotted arrows indicate contract sales. Solid lines represent the sale of ready-made goods. Subcontracting, common in the weaving industry and in silkworm rearing, is depicted by a pair of dotted lines, the bottom

¹The information required to create the map is gathered from participants and other actors in the system - key informants - via interviews, site visits and observation, combined with a literature review. See Boomgard et al. (1986) for details on research methods.

THE THAI SILK SUBSECTOR MAP



one showing raw material supplied by the parent firm to the subcontractor and the top one showing the reverse flow of finished product back to the parent.

When individual firms or households perform a sequence of functions, the map describes that vertical integration through an elongated vertical box that spans the functions performed in-house. In that way, Figure 1 shows that both traditional weavers (Channel 1) and the Jim Thompson company (Channel 5) are completely integrated vertically. Both perform the same series of functions internally, from mulberry production up through retailing. In cases where firms contract out a function or where vertical integration allows them to "skip" a function, the map depicts this with a pair of dotted vertical lines. In this way, each box on the map describes a common configuration of corporate or households enterprises that perform that particular combination of functions.

Technology

Each function may be accomplished using a range of technology. In silk production, important differences emerge at four levels in the subsector.

Mulberry

Mulberry production offers three alternative technologies: rainfed cultivation of native varieties, rainfed hybrids, and irrigated hybrid stock. Yields vary dramatically, rising from 2.8 tons of leaves per hectare among rainfed native varieties up to 6.8 tons per hectare among rainfed hybrids. Although small farmers rarely irrigate mulberry, the few commercial farmers who do achieve yields as high as 11 to 20 tons of leaves per hectare. Because a silkworm's diet consists solely of mulberry leaves, the volume of leaves available to a household sets a limit on its potential for cocoon production. Moreover, quality of mulberry varies depending on soil type, freshness, and handling of the leaves. Industry experts suggest that "70 percent of cocoon quality is good mulberry." Since leaves must be consumed within a few hours of cutting, long-distance trade in mulberry leaves is not possible. Although some trade occurs among villagers in very close proximity, the market is thin. In practice, all rearing households must grow their own. Access to mulberry is thus the key to scale, quality, and economy in rearing.

Rearing

In silkworm rearing, three different classes of silkworm breed offer the most fundamental technical contrast in the subsector. Villagers typically rear native Thai breeds. Well adapted to the environment, these hardy worms produce small, yellow cocoons.

But modern breeding has produced two classes of hybrid silkworms, Thai-foreign mixes (yellow hybrids) as well as crosses between two foreign parents (white hybrids), typically using breeding stock from Japan, China or Korea. Bred in research stations and laboratories, the hybrid eggs are distributed to rearing households on cardboard egg sheets or in egg boxes.

For the producer, the shift from native to yellow then white hybrids offers a progression from hardy to increasingly delicate worms requiring greater control of temperature, feed, humidity and pests. In return the hybrids produce larger cocoons and longer, stronger filaments (Table 2). Returns are greater, but so is the complexity, investment, mulberry requirements and risk. Because of the higher investment and land requirements, white cocoon raising typically becomes a full-time, male-dominated pursuit rather than a part-time, female activity.

TABLE 2
CHARACTERISTICS OF ALTERNATIVE SILKWORM BREEDS

	Native Breeds	Improved Natives	Yellow Hybrids	White Hybrids
Origin	Thai	Thai	Thai -foreign hybrids	Thai -foreign hybrids
Color	Yellow	Yellow	Light yellow	White
Thread to cocoon weight	8-9%	12-15%	15-20%	20-25%
Filament length (meters)	300	400	600	1,300
Voltinism (1)	multi	multi	poly-bi	bi-bi

- (1) Voltinism defines the number of times per year that parent silkworms breed in nature. In warm climates, they breed year-round. Hence they are multi-voltine. But in colder climates, like Japan and Korea, they breed only twice a year, making them bi-voltine. In laboratories, researchers can produce hybrids year-round, regardless of the voltinism of the parent breeds.

Reeling

Reeling the cocoons offers a similar range of technical options. Village women and children traditionally reel by hand, pulling the strands of yarn up through a simple tripod suspended over small pots on an open fire. They coil the yarn alongside them and add additional cocoons as some become unwound. By maintaining a constant number of cocoons, they can produce a yarn of consistent thickness. With this simple equipment, women can reel 150 grams of cocoons per day. Improved manual reeling equipment, although not in widespread use, promises to quintuple output to about 750 grams of cocoons per day.

Small reeling mills use a similar procedure, although their operators man a bank of reeling tanks rather than just a single pot. While they maintain a strict count on the number of cocoons in each tank, an electric motor drives a spindle that pulls the silk threads out of the vats with constant pressure and speed. The electric motors operate at far greater speeds than is possible in hand reeling, processing 30 kilograms of cocoons per day. Large reeling mills use completely automated systems called multi-end reeling equipment. Mechanical counters and flipper arms add cocoons when necessary to maintain a

constant number in each tank and thus an even weight of yarn. Long banks of large reeling machines turn out volumes five to ten times as great as in the small mills.

Despite differences in scale, both large and small factories reel only white cocoons. Their automated machinery is not suitable for yellows; indeed it may not be suitable for local whites. Yellow cocoons gum reeling machines and produce lower quality yellow yarn.

Weaving

Thai silk, by carefully cultivated reputation, is woven on handlooms. Villagers traditionally use simple hand-shuttle looms, while the weaving factories prefer fly-shuttle handlooms. Differences in quality clearly exist and here, as everywhere, the Jim Thompson Company has been a key innovator. His fly-shuttle looms have tighter tension, softer returns, and allow far greater production speed than the standard models used in the small weaving mills. Output per day ranges from 1 yard on handlooms to 5 on normal fly-shuttle looms and as many as 10 on Jim Thompson's improved fly-shuttle looms.

Powerlooms set up by the Japanese in the late 1980s operate in only five Bangkok plants. They produce silk kimono cloth exclusively from imported silk yarn. Although they process a large volume of raw silk, the texture, weave, and source of raw materials make powerloomed kimono cloth substantially different from authentic Thai silk.

Alternate Supply Channels

Six interrelated supply channels operate in the Thai silk subsector. Figure 1 provides a graphic representation of these channels.

Channel 1: Traditional Producers

Operating as they have for centuries, traditional producers perform all necessary functions themselves. They grow mulberry, rear silkworms, reel the cocoons into yarn, and weave yarn into cloth.

They operate at low volumes and employ traditional technology at each step. For mulberry, they grow indigenous varieties on small household plots. They rear native yellow silkworms, well adapted and easy to raise but with very low output. The producers breed silkworms themselves simply by allowing some worms to hatch as moths then using these as "mothers" for the next cycle. Rearing takes place under the house in trays covered with cloths. After hand reeling, they dye the yarn and weave it on a thrown shuttle handloom. They produce traditional weaves of cloth, *matmi* for women and sarongs for men and women. *Matmi* varies greatly in complexity of design and weave. Consequently, if sold, its price may vary considerably, although weavers retain much output within the family for ceremonial use or for barter within the village. They direct their sporadic sales at the domestic Thai market. With individual households producing perhaps six kilograms of cocoons per year, this production system is characterized by low technology, low volume, low cost, and low revenue.

Channel 2: Household Weft Yarn Producers

To participate in the rapidly growing tourist and export markets, traditional household producers must specialize. Most gain access by supplying weft yarn (the horizontal weave) to factory weavers in Channels 3, 4, and 5. This knobby yellow weft characterizes Thai silk, and its demand grows in direct proportion to output in the weaving mills.

As they specialize by selling at least a portion of their yarn production, many women also shift to rearing yellow hybrid silkworms. This increases productivity and earnings but also the complexity and cash requirements for participating households. For each cycle, they must procure eggsheets from the Department of Agriculture Extension.² Because they are typically clustered together in "silk villages," women normally coordinate input procurement by sending a single representative to the DOAE assembly point the day eggsheets are available. The DOAE, which sells eggsheets at about 50 percent below cost, cannot supply as many as people wish to purchase at the subsidized price. As a result, most households continue to raise traditional breeds alongside the yellow hybrids.

Itinerant yarn merchants typically purchase surplus yarn from these household producers. Through a network of larger merchants and factory buying stations, they deliver the yellow weft yarn to factory weavers in Channels 3, 4, and 5. As Figure 1 shows, the yarn merchants provide the bridge between household yarn producers and the huge tourist and export markets. Table 3 indicates trends in yarn production and imports

Channel 3: Small-Scale Modern Thai Silk

Channels 3 through 5 produce high-quality Thai silk for the tourist trade, upscale urban Thai consumers, and export markets. All three channels use primarily household-produced yellow weft yarn. What distinguishes the three is their source of warp yarn, the long vertical strands that run the length of the one-meter-wide bolts of silk cloth. Because the strength and evenness of warp yarn to a large extent determines the quality of the final cloth, weavers of high-quality Thai silk all insist on white warp. Until recently, they have depended mostly on imported warp yarn. But an emerging local reeling industry has begun to produce domestic white warp as well.

Production in Channel 3 begins when DOAE distributes white hybrid eggsheets to small commercial farmers or village producers. After rearing the worms, the producers sell white cocoons to small reeling companies that dry them and produce warp yarn with small-scale mechanized reeling equipment. The small reelers sell their yarn primarily to small and medium weaving mills, those that house 5 to 60 looms under one roof. The weaving factories supplement this with imports of white yarn from Brazil, China, Korea, and possibly with illegal imports from Vietnam and Cambodia. From Channel 2, they procure yellow weft yarn from household producers. Output from the weaving mills consists of designer prints and plain bolt cloth, which they distribute to the domestic tourist market via retailers in Bangkok and other centers.

The focal point of Channel 3 are the assembly points, geographic locations where small farmers and households converge to procure eggsheets at the beginning of each cocoon cycle and again 20 days

²Although DOAE is supposed to multiply the eggworms and produce and distribute eggsheets, in some cases DOAE is ill equipped for this task. In those situations, NSRI handles egg multiplication and distribution as well as research.

TABLE 3

TRENDS IN SILK YARN PRODUCTION AND IMPORTS, THAILAND
(tons)

		1980	1985	1990
1.	Domestic yarn production			
	a. weft	669	930	1,400
	b. warp	17	39	225
	c. total	686	968	1,625
2.	Imported yarn	322	430	881
3.	Total domestic use	1,008	1,398	2,043

Sources: Preeda Prapertchob and Partoon Kachamart, *Employment Potential of the Sericulture Industry in Thailand*, Bangkok: ILO, 1990, p. 3; EEC 1991, "Paper to The Seminar on The Development of Silk Production in The Northeast," Bangkok: EEC/MOAC Joint Secretariat Office.

later to sell their cocoons. Typically, the producers assemble at DOAE or NSRI research stations where they join buyers from the small reeling companies and NSRI technicians who supervise the grading of cocoons.

Channel 4: Large-Scale Modern Thai Silk

Channel 4 is the domain of the large reeling and weaving factories. The reeling companies supply white hybrid eggsheets and improved mulberry stock to contract farmers who rear the silkworms and then sell cocoons back to the parent reeling factory. As is typical of many subcontracting arrangements, the reeling companies frequently supply extension assistance as well as credit. All but one of the large reeling mills is located on the periphery of Pakton Chai, near Korat, where 90 percent of all silk is reeled and woven.

A typical, large reeling company works with as many as 400 contract farmers. The large reelers supply them with imported white eggsheets and eggboxes, often from China or Taiwan. Rather than depending on the supply and quality of locally produced white hybrids developed by the National Sericulture Research Institute, all companies prefer to import their own eggsheets or to produce their own. Typically a male, the average contract farmer grows one to two hectares of improved mulberry and operates year round.

Output of yarn from the four large reeling mills amounts to no more than 150 tons per year. All of it is taken up by the 20 or so large weaving mills that operate in Pakton Chai with over 100 looms each.

These large weaving factories contract out between one-third and one-half of their weaving to households in and around Pakton Chai. For the skilled weavers, this lucrative piecework offers the highest returns to household labor in the subsector, about 120 baht per day (Table 4). Because strict quality control is crucial to reputation and final output price, the large factories supervise their subcontract weavers closely. Many visit the villages two to three times per week to monitor production quality and throughput. This tight control restricts subcontracting opportunities to households living within about a 15-kilometer radius of Pakton Chai.

TABLE 4
FINANCIAL RETURNS TO HOUSEHOLD LABOR
IN ALTERNATIVE NICHEs IN THE THAI SILK SUBSECTOR
(baht per 10-hour day)

Channel 1	Channel 2	Channel 3	Channel 4-5
Integrated traditional producers	Weft yarn hand reeled from yellow cocoons	White cocoons to small reelers for warp yarn	Subcontract weavers for large factories
4	15 (9)*	48	120

* Figure in parentheses is for households using traditional silk worm breeds. The number in the top row represents household using hybrid yellow silkworms.

Channel 5: Jim Thompson

Jim Thompson singlehandedly established the quality standards, marketing strategy, and reputation that today defines modern Thai silk. His company remains the industry leader, setting quality standards in all phases of production. Because of his unique reputation for quality and design, his silk commands the highest price of any in the market.

Like village producers at the other end of the quality spectrum, the Jim Thompson company runs a fully integrated operation. Among the weaving factories targeting the domestic tourist and export

markets, his is the sole corporation performing every function in-house. It is one of only two companies large enough to propagate improved mulberry and produce eggsheets for its 800 contract farmers. It employs 800 weavers at the Pakton Chai factory and subcontracts out weaving to another 600 nearby village weavers who operate out of their homes. The company retails virtually all its own output through its famous original retail outlet in Bangkok. They have recently opened a second store and, in the near future, the company plans to begin retailing internationally.

Channel 6: The Powerloom Industry

Located around Bangkok are four or five powerloom weaving plants, established with Japanese involvement to produce obi and kimono silk for export to Japan. This international subcontracting arrangement uses cheap Thai labor to weave standard Japanese kimono silk. They use only the highest-quality white yarn for these products, necessitating complete reliance on imports (Table 3). Thus they have no direct supply connection with any of the other channels. Although they process a large volume of raw silk, the texture, weave, and source of raw materials make it substantially different from authentic Thai silk.

Even so, they remain important participants in the Thai silk subsector because they lobby heavily for yarn imports, and this affects prices and the competitiveness of local white warp reelers in Channels 3, 4, and 5. Although not commercially linked to the other silk firms, they influence policy important to the other subsector participants.

DYNAMICS

Driving Forces

Market Demand

The key to resurgence in Thai silk production has been the shift from the domestic ceremonial market to tourist and export markets. Higher quality and higher prices have played a central role in expanding output and returns in silk production.

Today, the demand for traditional ceremonial dress accounts for only about 10 percent of total silk sales. This demand has peaked and probably even declined absolutely in past decades. Although mature adults and rural dwellers retain their affinity for the intricate tie and dyed *matmi* and sarongs, they still use them only for ceremonial wear and special occasions, just as they always have. In the village, they bring them out once a year for a temple visit and carefully return them to the scented chest. Young adults, in contrast, are inclined to adopt western dress instead.

By far the largest and most rapidly expanding segment outlet for Thai silk is the aggressively expanding domestic tourist market. Thailand has assiduously cultivated its image as one of the world's premier exotic vacation spots. These affluent visitors offer a captive market that now accounts for 65 percent of total silk sales. Anticipated steady growth of the Thai tourist industry together with expanding mass appeal of silk worldwide promises a steady expansion of this important outlet.

Exports could grow even more rapidly. Currently, Thailand produces only 2.4 percent of the world's raw silk (Table 1). So the Thais could increase their exports manyfold without glutting world

markets. Yet unlike the domestic tourist market, where Thai silk faces no rivals, the export market brings Thailand into keen competition with traditional producers like Korea and China, as well as newly established ones such as India, the Japanese-financed operations in Brazil, and others that are aggressively expanding output. Although export growth holds great promise because of growing world demand for silk, it also offers greater competition and risk.

Technological Change

The shift to tourist and export markets has required that silk producers substantially upgrade their quality. To do so, they require improvements in technology at all levels of the subsector. Through local experimentation and technology imports, they have made great progress in mulberry production, silkworm rearing, and weaving. The resulting increase in productivity has raised returns to labor and thus incentives to household producers in what is traditionally a low-return endeavor (Table 4). However, in spite of considerable attention, village reeling remains an unresolved technological bottleneck.

Hybrid Silkworms. Local varieties of yellow silkworm have served the village producers for generations. Yet what has long been acceptable to a village weaver is no longer adequate for the commercial weavers. They require improved quality and longer and stronger filaments for their warp yarn.

So, for the past 20 years, NSRI has been crossing native silkworms with breeds from Japan and China. Through these yellow Thai-foreign hybrids, they aim to produce silkworms with these desired qualities, but adapted to local conditions. Although they represent a great improvement over native breeds, the yellow hybrids bred by NSRI do not produce the quality of filament required for good warp yarn (Table 2). Gradually, the large handloom weaving companies have adopted white warp yarn as their necessary standard. The tastes of the market have moved in parallel — to ever smoother fabrics and modern designs.

Responding to the demand for white yarn, NSRI has also crossbred white Japanese and Chinese silkworm breeds in their search for even longer, stronger filament, and more filament per cocoon. In spite of 20 years of research, the NSRI has not yet bred silkworms that can rival the quality of yarn obtained from the hybrids eggs imported from Japan, China, and Korea. They continue their research, joined by Jim Thompson and another large private company. But it is likely to be some years before the powerloom weaving companies, in particular, will be satisfied with the quality of local white hybrids.

Hybrid Mulberry. Expansion of rearing requires an ever greater supply of mulberry leaves to feed the growing silkworm population. In the face of land scarcity, this expansion increasingly requires raising mulberry yields. In response, NSRI research has successfully bred high-yielding hybrids. Propagation and distribution of the hybrids becomes a necessary component of the technical package that aims at raising village cocoon output via the introduction of hybrid worms.

Improved Looms. Improved looms have enabled hand weavers to increase both the quality and volume required by the tourist and export markets. A visit to the large handloom weaving companies reveals a charging cavalry of weavers rocking in the saddle like jockeys, pedalling with their feet and flailing with their arms at a flying shuttle cord and rocker arm. Weavers operating on these improved looms fly along, producing five times as much output as is possible on traditional village looms. They also produce a higher grade of cloth with a much finer and tighter weave. Jim Thompson and others continue to experiment and refine their looms in an effort to improve quality and output still further.

Improved Reeling. Technological improvements in reeling have not yet penetrated the villages. Household producers still reel yellow cocoons by hand using a technology unchanged for centuries, in part because of the high cost of the prototype improved hand reeling sets.

Reeling presents a major bottleneck to households wishing to expand yarn production. Because eggsheets are distributed at one time each cycle, all cocoons mature within a very short period. The women have a four- to five-day window during which they must reel the cocoons or else they will hatch and destroy the threads.

Input Supply Constraints

Households wishing to take advantage of the new technologies and the growing demand for high-quality silk require an expanding supply of mulberry and hybrid eggsheets. On both counts, rearing households have faced difficulties for some time.

Eggsheets. Without doubt, yellow and white hybrid eggsheets are the inputs in shortest supply today. And acute shortages are likely to remain for some years to come. Households and small farmers operating in Channels 2 and 3 depend solely on DOAE or, in some cases, NSRI for eggsheets. For yellow hybrids, they are able to supply only 25 percent of estimated demand. Likewise, industry experts estimate the DOAE supply of white hybrid eggsheets currently satisfies only a small fraction of total demand. Contract farmers in Channels 4 and 5 receive their eggsheets directly from the large reeling companies, which import them, and from Jim Thompson, who produces them.

Expansion of hybrids outside the tight geographic area served by Jim Thompson and the five large reeling companies will depend on improving availability from DOAE. Currently, their limited budget drastically restricts eggsheet distribution. In addition, their release of eggsheets at 50 percent of market price surely exacerbates the supply shortage by increasing demand and undercutting private supply sources that might otherwise fill the gap.

Mulberry Supply. To expand mulberry output, contract farmers in Channels 4 and 5 are better positioned than the rearing households in Channels 2 and 3. Jim Thompson supplies the improved mulberry stock required by his contract farmers in Channel 5. Similarly, in Channel 4 the second largest silk reeling company, Chun Mai Tai, propagates hybrid mulberry and supplies cuttings to its contract farmers.

But household producers in Channels 1, 2, and 3 depend largely on NSRI as a source of improved mulberry cuttings. As with eggsheets, their supply remains totally inadequate, even today. In response, some farmers have apparently begun operating small nurseries, supplying improved mulberry to other rearing households.

Competitive Pressures

Changing Incentives. Change can sweep rapidly across the Thai silk industry. Prices fluctuate because of the entry and exit of large actors in the world silk market, especially suppliers like China and Japan. Gyration government policies on input pricing and imports affect yarn availability, its price, and the grades of yarn demanded from village producers. These pressures lead to rapid change — in prices, incentives, and the viability of various niches occupied by household producers. Under current prices, Table 4 describes the incentives facing household producers.

Yarn Import Quotas. Tension between the needs of large reelers and large weaving firms leads to vacillating government policy on import quotas for silk yarn. For two years, from February 1989 through November 1990, the interest of powerloom and large handweaving factories held sway as government allowed unrestricted import of silk yarn. This lowered demand for locally reeled white yarn and forced small reelers to limit their purchases of white cocoons. Since November 1990, as before February 1989, the government has imposed import quotas. So sales of locally reeled yarn and of white cocoons have become brisk once again. But the ongoing struggle between these dominant large firms whipsaws the small reelers and rearers of white cocoons as they bear the brunt of wildly fluctuating demand for their output.

Competition for Inputs. Households compete with commercial farmers for access to DOAE egg sheets and improved mulberry. Weaving companies compete for access to imported warp yarn. This competition in the face of severely restricted input supplies clouds prospects for household producers of white cocoons.

Large Companies. Interdependence and competition with large firms lie at the root of many of the competitive pressures faced by household silk producers. The large weaving factories, reelers, and powerloom operators dominate the subsector. They set the design and quality standards in the weaving industry. They determine input requirements and standards. They influence policy and prices and, to a large extent, frame the prospects for small household producers. To survive and thrive, households must either find niches where they can effectively compete with the large firms, or they must locate opportunities in the ascendant channels where they can ride along on the large firms' coattails.

Ascendant Channels

Traditional producers in Channel 1, those supplying ceremonial silk wear, have been on the wane since the early decades of this century. The rapid pace of social change in Thailand, the plunge toward urbanization and the internationalization of culture and tastes, mean that this market will almost certainly continue to decline in the future. Some estimates place this decline at 10,000 to 12,000 producers per year.

Instead, the spectacular growth in Thai silk production has all focused on the high-quality domestic tourist and export markets. Jim Thompson, in Channel 5, and the large reeling and weaving companies, in Channel 4, have directed this reorientation. They have set the pace of growth as well as the design and quality standards that prevail today. These industry leaders have integrated vertically and invested heavily to insure their supply of high-quality cocoons and yarn. Consequently, they now operate independently of the GOT efforts in sericulture, even to the extent of breeding their own silkworm varieties. So long as the domestic tourist market and the export market for silk expands, these large firms are well positioned to grow in step with them.

In contrast, Channel 3 is least well equipped to profit from the growth in tourist and export markets. Households rearing white hybrids for small reeling companies depend completely on GOT supply of egg sheets and improved mulberry. Although government is gearing up to expand services, they have, to date, fallen far short of producer requirements. Volatile world silk prices (Table 5) make competitiveness and returns in this channel fluctuate widely from year to year. Channel 3's small rearing households also bear the brunt of any compression resulting from changes in yarn import quotas. Should government accede again to the wishes of the large weaving factories and permit unlimited yarn imports, as they have for the past two years, the small reeling companies could once again find themselves unable to sell their warp yarn. In spite of progress, it still does not match the quality of comparably graded

TABLE 5

TRENDS IN INTERNATIONAL SILK PRICES
(dollars per ton of raw silk yarn, Yokohama wholesale grade 2A)

	1970	1980	1985
Current price	8,032	16,225	15,179
Constant, 1980 price	11,775	16,225	12,370

Source: FAO, *Sericulture Development in Asia*, Bangkok, 1989, p. 154.

imports. In that event, the small reelers in turn would again cease buying local white cocoons. Given the growing supply shortages worldwide and the intensive research efforts under way to improve the quality of NSRI white hybrids, these producers may ultimately enjoy tremendous growth potential. But until they attain quality and cost competitiveness with imports as well as reliable input supply, this channel will prove riskiest for household producers.

Suppliers of weft yarn, in Channel 2, will enjoy steadily growing demand as Channels 3, 4, and 5 expand to supply the growing tourist and export markets. Given the low price of yellow weft yarn — one-third to one-half the cost of white warp — its growth path seems secure. Because of improved technology in mulberry, silkworm varieties, and potentially in reeling, returns in this channel represent a substantial improvement over those of traditional production. For household producers, improved earnings and solid growth prospect make this channel most promising for the bulk of the rearing households.

Prospects for powerloom exports of kimono cloth, in Channel 6, depend on both availability of imported white yarn and competitive labor costs in Thailand. Thus far, these companies give every indication of having the necessary political clout to ensure necessary supplies of imported white yarn. Rising labor costs in Bangkok may, however, work against them over time.

OPPORTUNITIES FOR RURAL HOUSEHOLDS

For rural households to profit from the current expansion of Thai silk output, they will need to shift from their overwhelming presence in the stagnant Channel 1 to the rapidly growing tourist and export markets served by Channels 2-5. Three important niches offer household producers footholds in these ascendant channels. First, they can specialize as weavers working as employees or subcontractors for the weaving factories in Channels 3-5. Alternatively, they can specialize as producers of yellow yarn, operating in Channel 2 to supply weft yarn to the growing segments of Channels 4, 5, and 3. Third, they can rear white cocoons for sale to the small rearing factories in Channel 3.

Financial incentives make weaving, the first option, most attractive. As Table 4 indicates, households can earn the highest returns as weavers working for the large mills. There, they earn 120 baht per day, about six times what traditional village producers earn in Channel 1. Unfortunately for most, this option is only available to villagers living within a tight radius of Pakton Chai, the hub of the factory weaving industry. To supervise village subcontractors adequately, factory managers must be able to reach their subcontractors by motorbike quickly and easily. Although highly sought after, these weaving positions are available to only a few households.

By contrast, virtually all households in Northeast Thailand can cross to the ascendant channels by specializing as yarn producers. By shifting from Channel 1 to Channel 2, they can supply yellow weft yarn to the factory weavers in Channels 3-5. Although this foothold is large and its growth prospects secure, the financial incentives are not as attractive as in weaving. Not unless households switch to improved technologies — hybrid mulberry, yellow hybrid silkworms, and improved hand reeling equipment. As Table 4 indicates, households can double their returns — from 4 to 9 baht per day — if they switch from Channel 1 to specialized suppliers of yarn in Channel 2. Improved technology, in the form of improved reeling and the use of hybrid yellow silkworms, could raise those returns even higher, to 15 baht a day.

They can earn still higher returns by pinning their hopes on option 3, by specializing as white cocoon rearers in Channel 3. Those who have the necessary 15,000 baht (\$600) investment and 2 rai of land, can earn 48 baht per day, ten times the 4 baht per day earned in Channel 1. Ultimately, this may prove most attractive to the better-off rural households. But women will have difficulty participating in this channel given its full-time, year-round focus. And unless investment costs can be reduced substantially, most will not be able to rear the white hybrid worms properly. Even those who can must trade off higher returns against the limited access and considerable risks currently associated with Channel 3. They depend on DOAE for eggsheets and improved mulberry, and they depend on yarn import quotas to guarantee a market for their cocoons. As international prices fluctuate (Table 5), so do their output prices and returns. Compared to rearing yellow hybrids (Channel 2), the village producer of white cocoons (Channel 3) embarks on an activity that is significantly more complex, requires more land and substantially more investment capital, and bears the risk of insecure input supply and uncertain market outlets for cocoons.

CARE's initial efforts in silk promotion suggest that traditional producers can most easily progress from rearing native breeds to the improved yellow hybrids. The shift does not demand enormously expanded resources or skills. Consequently, returns increase with little additional risk. So for the vast majority of rural households, Channel 2 is where the real opportunities lie. The technology and resources required are manageable, and the demand for the product is directly linked to excellent growth prospects of the commercial weavers.

LEVERAGED INTERVENTIONS

The Concept of Leverage

CARE, the Thai government, and many others would like poor village households to benefit from anticipated growth in silk output. To help them do so in the face of budget limitations, CARE must pose the following question: How can we raise village incomes the greatest extent possible, given our limited budget?

The answer is to search for leverage. Leveraged interventions refer to those that affect a large number of rural households at a single stroke. To achieve widespread impact, leverage becomes essential because household silk operators are so small and individual contact costs consequently become very high. Instead of visiting individual households, project resources should be applied at points in the system where they influence dozens, hundreds, or thousands of households at once.

By greatly expanding project benefits and simultaneously lowering per-household contact costs, leveraged interventions are far more likely than others to be cost-effective. Those who seek economic efficiency — income benefits greater than project costs — will find leveraged interventions more effective than those dealing with individual households one-on-one. Those who focus exclusively on the very poor will likewise profit; leveraged interventions will locate opportunities for helping the greatest number of poor households, given budgetary limitations.

Subsectors and Leverage

Subsector analysis is a set of analytical methods that aims to systematically explore the opportunities for leveraged small- and micro-scale enterprise (SME) interventions. Details are available elsewhere,³ but the basic procedure is simple: locate the confluence between opportunities for SME growth and opportunities for leveraged interventions. This boils down to examining which interventions will unleash the greatest SME growth and, among them, which are amenable to the use of leverage.

The preceding analysis has identified the greatest SME growth opportunities in Channel 2 as suppliers of weft yarn to factory weavers. To a lesser extent, opportunities exist in Channel 3 for household rearers of white hybrid cocoons. The bottlenecks in both channels are mulberry supply, access to egg sheets, and improved reeling technology. How then can leverage be applied to relieve these bottlenecks?

Sources of Leverage

In general, projects can locate leverage in four principal ways. Three revolve around system nodes, points where large volumes pass through a few hands or through restricted geographic space. The fourth focuses on policies, which by their very nature influence thousands of small businesses at the stroke of a pen.

1. **Input Suppliers.** One or a few input suppliers may furnish key inputs to hundreds or even thousands of small household businesses. For example, six DOAE and NSRI stations supply egg sheets to 4,000 rearing households. Also, in some districts, large mulberry farmers and commercial nurseries reportedly supply improved mulberry stock to hundreds of rearing households.

2. **Marketers of SME Output.** A few large firms or agencies may market output produced by a bevy of small businesses. Yarn merchants in Channel 2 figure prominently in this category. This network of probably several hundred merchants purchases yarn from tens of thousands of household reelers.

³See Boomgard et al. (1986, 1991).

3. Geographic Clustering. Small and household firms frequently cluster at certain geographic locations to share common equipment, to procure common inputs, or to market output; they may also cluster simply by historical accident. Silk producers, for example, typically cluster in silk-producing villages, normally because of access to mulberry land and a general shortage of other opportunities for women. Even more important are the assembly points, where rearing households procure hybrid eggsheets then, in Channel 3, return to sell white cocoons. Many key actors — DOAE and NSRI staff, village rearing households, and buyers from small reeling factories — converge at these assembly points. And they converge during a very tight, well-publicized time span, the few days during which eggsheets are distributed and the corresponding time 20 or so days later when the cocoons have matured and are ready to be reeled. Thus the assembly points offer prospects for reaching hundreds of key subsector actors in a single visit.

4. Policy Leverage. Policies, to the extent they are enforced, affect an entire population of small producers. Restrictions on silk yarn imports have, between February 1989 and November 1990, artificially raised the volume of white warp yarn factory weavers were willing to purchase domestically. This policy affects the roughly 3,700 household and commercial producers of white hybrid cocoons. On another front, tariff policy affects the entire spectrum of household silk producers by influencing the price of competing imports and imported raw materials. Also, the current 50 percent subsidies on eggsheets reduces the input cost paid by the rearing households. The subsidies, combined with the limited budget of the NSRI, affect many more households who would like to raise hybrids but who are unable to obtain eggsheets because of the NSRI/DOAE budget limitations and because the subsidy discourages private firms from distributing the eggsheets at market rates.

Potential Leveraged Interventions in Thai Silk

A comparison of opportunities for growth with opportunities for leverage suggests several areas of confluence.

1. Propagate and Distribute Hybrid Mulberry Via Nurseries or Commercial Farmers. Village producers in Channels 2 and 3 need access to hybrid mulberry if they are to expand their output of cocoons and yarn. Yet the supply of cuttings available from NSRI is limited. Even if their capacity expands greatly, many households do not have sufficient land to increase the size of their mulberry holdings. Clearing out native varieties of mulberry to plant improved one interrupts production in the short run to increase it in the future.

Grafting offers prospects for increasing mulberry output with existing land while using hardy native root stock. An initial review of the literature and discussions with NSRI suggest the technique has good potential. If it proves viable, the nursery operators found in many small towns could be trained in grafting techniques and encouraged to propagate and disseminate improved stock in surrounding villages. They could sell the stock and offer their grafting services directly in farmer fields.

2. Increase Output of Hybrid Eggsheets by Lobbying for Reduced Subsidies. Increased supply of eggsheets will be essential if household producers are to enjoy the opportunity of rearing yellow and white hybrid cocoons. The most important role CARE could play in helping increase this supply is to claim a place at the policy table to argue for reduced subsidies on DOAE-produced eggsheets. Ironically, the subsidies that are intended to increase local production of hybrid cocoons only hinder those efforts. Subsidies limit the number of eggsheets NSRI can distribute through DOAE with a given budget and also deter private sector supply.

Equally important is CARE's potential role as a voice making the case for moving to yellow hybrids as the traditional producers' first step into new technologies. This initial review suggests that agencies may be placing too much emphasis on white hybrids to satisfy the weaving industry. Many female producers simply do not have the cash, land, or labor resources to make the move into white cocoons. Instead, their future lies in increased output of yellow yarn, and hybrid yellow eggsheets will greatly enhance their ability to do so.

Although CARE has little experience working with policy reform, it does have credibility because of its three years of field experience in silk promotion. Through its ongoing relationship with the International Labour Organization, the Food and Agriculture Organization, and the U.S. Agency for International Development, it may be able to make the case for price reform that would benefit rural cocoon-rearing households.

3. Distribute Improved Reeling Technologies at Assembly Points or Via Yarn Merchants. Hand reeling of yellow cocoons is labor intensive, the returns are low, and, because of the four-day window within which cocoons must be reeled before they hatch, reeling often limits the volume of silkworms individual village women can rear. So improved reeling productivity would not only allow increased output, it would double returns to labor. These higher returns are potentially available throughout Channels 1 and 2 to hundreds of thousands of producers currently using traditional hand reeling technology.

CARE already has experience with pilot dissemination of one improved reeling technology developed by the Department of Industrial Promotion. Village women have apparently welcomed it, not surprisingly given that it increases reeling output by a factor of five.

Given the spate of work already undertaken by a variety of agencies, it will be important to thoroughly review their experience. Pertinent agencies include the Division of Textiles, Department of Industry Promotion, and others in Thailand — and outside of Thailand if possible — which have been experimenting with village reeling technologies. Any review should include an investigation of the options for power driven reelers, since practically every village has electricity. The services of a technology consultant with links to international Intermediate technology agencies, such as the Intermediate Technology Development Group or Appropriate Technology Institute, may also be beneficial.

Assuming an "appropriate" device can be designed and produced at low cost, it could be demonstrated and perhaps even disseminated at the assembly points where eggsheets are collected and cocoons sold. Yarn merchants could also distribute improved reelers to the villagers they buy from. It is in their interest to increase the output of village yarn, since their earnings grow along with the volumes they market. Because they visit their supplying villages regularly and because they know intimately the determinants of yarn quality, they are well positioned to serve as persuasive, low-cost distributors of any new technology. Production of the reeling equipment may have to be handled separately, in which case the middlemen might work on commission for a fabricator.

4. Disseminate Information at Assembly Points. Many times, village producers are isolated from the events and forces shaping change in the silk subsector. And they may be unaware of potential resources available to them. Moreover, outsiders may restrict or manipulate the information flows into the village.

Villagers need to remain abreast of the following sorts of information:

- **Prices of cocoons and yarn;**
- **Availability of improved technologies;**
- **Explanation of the risks and rewards of moving into new technologies;**
- **Low-cost investment packages for rearing white cocoons; and**
- **Linkages into DOAE training sessions.**

Because of its initial work in promoting village-level silk production, CARE is experienced at disseminating information and serving as an honest broker for village producers. The potential for leveraged expansion of this work exists because the assembly points offer prospects for disseminating CARE's experience to a far wider audience than they have with their village-level extension.

5. Research and Disseminate Cocoon Steaming or Air Drying Technologies for Small Reeling Companies. Small reeling companies do not always have their own equipment for treating the cocoons they purchase with steam or hot air. This treatment is necessary to prevent the cocoons from hatching, thus permitting storage and an even flow of throughput in the reeling mills. Outside of Pakton Chai, reelers rely on a very few government-supported operations that have the large-scale cocoon treating equipment. This restricts white cocoon marketing to those few locations.

Technology appropriate for small reeling companies to kill the worms themselves would enable them to purchase and store cocoons. Households would then be able to rear white cocoons across a much broader range of locations. To develop a suitable small-scale technology would first require research into existing technologies in Thailand and other silk producing countries. Then investigators could proceed with development, testing, and dissemination.

Leverage and the CARE Philosophy

In spite of an impressive array of potentially effective, leveraged interventions, the proposed strategies may not sit well with all CARE staff. For leverage frequently requires indirect intervention. It often entails intervening on behalf of rural households by working with other participants, up- or down-stream in the subsector. These intermediaries, then, transmit inputs, information, or technology to the target households.

But CARE aims to assist poor village households. Is it legitimate to assist them indirectly? Without looking them in the eye, how can we be sure the villagers enjoy the benefits we intend for them? Many CARE staff share this legitimate concern.

Since staff motivation is key to the success of any intervention, CARE must decide up-front if leveraged interventions are consistent with their mandate to help the very poor. A monitoring and evaluation system, such as the one proposed for CARE's Thai silk projects, can be designed to verify that villagers actually benefit through indirect interventions.

Ultimately, the most powerful argument for leverage is the observation that if we really wish to help the poor, surely it is better to help hundreds and thousands rather than only handfuls. The virtue

of leverage is that it strives to provide maximum benefits to the target group given an inevitably limited project budget.

CONCLUSIONS

The silk subsector holds enormous promise as a potential engine of income growth for poor village households. But to take advantage of this growth, most producers will have to shift from the low-productivity, low-growth traditional markets (Channel 1) to the rapidly growing tourist and export markets served by Channels 2-5. Because large factory weavers and reeling companies dominate these growing segments of the market, the households' most promising entree into these ascendant channels is to specialize in weft yarn sales to the weaving factories. By shifting from Channel 1 to Channel 2, they can grow in tandem with the modern Thai silk weaving industry and roughly double their labor productivity at the same time.

In the future, household producers may find that rearing white cocoons (Channel 3) offers a second promising niche. Today, however, white cocoons are both expensive and risky.

Under either option, CARE can play a vital role in this evolution by actively facilitating household access to these promising niches. Although the proposed interventions will require further review, the array of options suggests that it may well be possible to intervene in ways that will facilitate household access to promising, growing niches. The availability of leverage points offer prospects for cost-effectively assisting tens of thousands of poor households.

REFERENCES

- Boomgard, James J.; Agriculture, Stephen P.; Haggblade, Steven J.; and Mead, Donald C. 1986. "Subsector Analysis: Its Nature, Conduct and Potential Contribution to Small Enterprise Development." MSU International Development Papers, Working Paper No.26. East Lansing, MI: Department of Agricultural Economics, Michigan State University.
- Boomgard, James J.; Agriculture, Stephen P.; Haggblade, Steven J.; and Mead, Donald C. 1991. "A Subsector Approach to Small Enterprise Promotion and Research." *World Development* (forthcoming).
- EEC. 1991 "Paper to the Seminar on the Development of Silk Production in Northeast Thailand." Bangkok. EEC/MOA Joint Secretariat Office.
- FAO. 1989. *Sericulture Development in Asia*. Bangkok: Regional Office for Asia and the Pacific (RAPA).
- Haggblade, Steven. 1991. "A Proposed, Subsector-Based Monitoring and Evaluation System for CARE/Thailand's Silk Promotion Efforts."
- Henle, H.V. 1990. *Employment as a Function of Market Opportunities: The Case of Sericulture - Introduction to Pre-Feasibility Studies*. Bangkok: Department of Labor and International Labor Organization, Asian Employment Programme (ARTEP).
- Prapertchob, Preeda, and Kachamart, Partoon. 1990. *Employment Potential of the Sericulture Industry in Thailand*. Bangkok: Department of Labor and International Labor Organization, Asian Employment Programme (ARTEP).

GEMINI PUBLICATION SERIES

GEMINI Working Papers:

1. "Growth and Equity through Microenterprise Investments and Institutions Project (GEMINI): Overview of the Project and Implementation Plan, October 1, 1989-September 30, 1990." GEMINI Working Paper No. 1. December 1989. [not for general circulation]
- *2. "The Dynamics of Small-Scale Industry in Africa and the Role of Policy." Carl Liedholm. GEMINI Working Paper No. 2. January 1990. \$5.50
3. "Prospects for Enhancing the Performance of Micro- and Small-Scale Nonfarm Enterprises in Niger." Donald C. Mead, Thomas Dichter, Yacob Fisseha, and Steven Haggblade. GEMINI Working Paper No. 3. February 1990. \$6.00
4. "Agenda Paper: Seminar on the Private Sector in the Sahel, Abidjan, July 1990." William Grant. GEMINI Working Paper No. 4. August 1990. \$3.00
- *5. "Gender and the Growth and Dynamics of Microenterprises." Jeanne Downing. GEMINI Working Paper No. 5. October 1990. \$10.50
6. "Banking on the Rural Poor in Malaysia: Project Ikhtiar." David Lucock. GEMINI Working Paper No. 6. October 1990. \$3.30
7. "Options for Updating AskARIES." Larry Reed. GEMINI Working Paper No. 7. October 1990. \$3.50
- *8. "Technology — The Key to Increasing the Productivity of Microenterprises." Andy Jeans, Eric Hyman, and Mike O'Donnell. GEMINI Working Paper No. 8. November 1990. \$3.60
9. "Lesotho Small and Microenterprise Strategy — Phase II: Subsector Analysis." Bill Grant. GEMINI Working Paper No. 9. November 1990. \$15.50.
- *10. "A Subsector Approach to Small Enterprise Promotion and Research." James J. Boomgard, Stephen P. Davies, Steven J. Haggblade, and Donald C. Mead. GEMINI Working Paper No. 10. January 1991. \$3.10
11. "Data Collection Strategies for Small-Scale Industry Surveys." Carl Liedholm. GEMINI Working Paper No. 11. January 1991. \$1.30.
12. "Dynamics of Microenterprises: Research Issues and Approaches." Carl Liedholm and Donald C. Mead. GEMINI Working Paper No. 12. January 1991. \$6.50.

13. "Dynamics of Microenterprises: Research Priorities and Research Plan." Carl Liedholm and Donald C. Mead. GEMINI Working Paper No. 13. August 1990. [not for general circulation]
14. "Review of Year One Activities (October 1, 1989 to September 30, 1990) and Year Two Work Plan (October 1 to November 30, 1990)." GEMINI Working Paper No. 14. January 1991. [not for general circulation]
- *15. "The Process of Institutional Development: Assisting Small Enterprise Institutions to Become More Effective." Elaine Edgcomb and James Cawley. GEMINI Working Paper No. 15. February 1991. \$9.70.
16. "Baseline Surveys of Micro and Small Enterprises: An Overview." Donald C. Mead, Yacob Fisseha, and Michael McPherson. GEMINI Working Paper No. 16. March 1991. \$2.60.
17. "Kenya: Kibera's Small Enterprise Sector — Baseline Survey Report." Joan Parker and C. Aleke Dondo. GEMINI Working Paper No. 17. April 1991. \$6.40.
- *18. "A Financial Systems Approach to Microenterprises." Elisabeth Rhyne and Maria Otero. GEMINI Working Paper No. 18. April 1991. \$3.00.
- *19. "Agriculture, Rural Labor Markets, and the Evolution of the Rural Nonfarm Economy." Steve Haggblade and Carl Liedholm. GEMINI Working Paper No. 19. May 1991. \$2.50.
- *20. "The Microenterprise Finance Institutions of Indonesia and Their Implications for Donors." Elisabeth Rhyne. GEMINI Working Paper No. 20. June 1991. \$3.40.
21. "Microenterprise Growth Dynamics in the Dominican Republic: The ADEMI Case." Frank F. Rubio. GEMINI Working Paper No. 21. June 1991. \$3.10.
- *22. "Credit Unions: A Formal Sector Alternative for Financing Microenterprise Development." John H. Magill. GEMINI Working Paper No. 22. September 1991. \$3.80.
23. "A Proposed Subsector-Based Monitoring and Evaluation System for CARE/Thailand's Silk Promotion Efforts." Steven Haggblade. GEMINI Working paper No. 23. September 1991. \$3.60.
24. "Steps to the Creation of a Viable Financial Institution for Microenterprise Development in the Philippines: Notes on a Process for the Staff and Board of Tulay sa Pag-Unlad, Inc." Doug Salloum and Nan Borton. GEMINI Working Paper No. 24. November 1991. \$2.00.
- *25. "Village Banking: A Cross-Country Study of a Community-Based Lending Methodology." Sharon L. Holt. GEMINI Working Paper No. 25. December 1991. \$12.60.
26. "Dynamics of Small- and Micro-scale Enterprises and the Evolving Role of Finance." Carl Liedholm. GEMINI Working Paper No. 26. December 1991. \$3.00.
- *27. "Opportunities for Intervention in Thailand's Silk Subsector." Steven Haggblade and Nick Ritchie. GEMINI Working Paper No. 27. January 1992. \$3.20.

GEMINI Technical Reports:

1. **"Jamaica Microenterprise Development Project: Technical, Administrative, Economic, and Financial Analyses."** Paul Guenette, Surendra K. Gupta, Katherine Stearns, and James Boomgard. GEMINI Technical Report No. 1. June 1990. [not for general circulation]
2. **"Bangladesh Women's Enterprise Development Project: PID Excerpts and Background Papers."** Shari Berenbach, Katherine Stearns, and Syed M. Hashemi. GEMINI Technical Report No. 2. October 1990. \$13.00
3. **"Maroc: Conception d'une Enquête pour une Etude du Secteur Informel."** Eric R. Nelson and Housni El Ghazi. GEMINI Technical Report No. 3. November 1990. \$12.50
4. **"Small Enterprise Assistance Project II in the Eastern Caribbean: Project Paper."** James Cotter, Bruce Tippet, and Danielle Heinen. GEMINI Technical Report No. 4. October 1990. [not for general circulation]
5. **"Technical Assessment: Rural Small-Scale Enterprise Pilot Credit Activity in Egypt."** John W. Gardner and Jack E. Proctor. GEMINI Technical Report No. 5. October 1990. \$4.00
- *6. **"Developing Financial Services for Microenterprises: An Evaluation of USAID Assistance to the BRI Unit Desa System in Indonesia."** James J. Boomgard and Kenneth J. Angell. GEMINI Technical Report No. 6. October 1990. \$9.00
7. **"A Review of the Indigenous Small Scale Enterprises Sector in Swaziland."** David A. Schrier. GEMINI Technical Report No. 7. October 1990. [not for general circulation]
8. **"Ecuador Micro-Enterprise Sector Assessment: Summary Report."** John H. Magill and Donald A. Swanson. GEMINI Technical Report No. 8. April 1991. \$10.20.
9. **"Ecuador Micro-Enterprise Sector Assessment: Financial Markets and the Micro- and Small-scale Enterprise Sector."** Richard Meyer, John Porges, Martha Rose, and Jean Gilson. GEMINI Technical Report No. 9. March 1991. \$16.00
10. **"Ecuador Micro-Enterprise Sector Assessment: Policy Framework."** Bruce H. Herrick, Gustavo A. Marquez, and Joseph F. Burke. GEMINI Technical Report No. 10. March 1991. \$11.30
11. **"Ecuador Micro-Enterprise Sector Assessment: Institutional Analysis."** Peter H. Fraser, Arelis Gomez Alfonso, Miguel A. Rivarola, Donald A. Swanson, and Fernando Cruz-Villalba. GEMINI Technical Report No. 11. March 1991. \$25.00
12. **"Ecuador Micro-Enterprise Sector Assessment: Key Characteristics of the Micro-Enterprise Sector."** John H. Magill, Robert Blaney, Joseph F. Burke, Rae Blumberg, and Jennifer Santer. GEMINI Technical Report No. 12. March 1991. \$19.60
13. **"A Monitoring and Evaluation System for Peace Corps' Small Business Development Program."** David M. Callihan. GEMINI Technical Report No. 13. [not available for general circulation]
14. **"Small-Scale Enterprises in Lesotho: Summary of a Country-Wide Survey."** Yacob Fisseha. GEMINI Technical Report No. 14. February 1991. \$6.40

- *15. "An Evaluation of the Institutional Aspects of Financial Institutions Development Project, Phase I in Indonesia." John F. Gadway, Tantri M. H. Gadway, and Jacob Sardi. GEMINI Technical Report No. 15. March 1991. \$8.80
- *16. "Small-Scale Enterprises in Mamelodi and Kwazakhele Townships, South Africa: Survey Findings." Carl Liedholm and Michael A. McPherson. GEMINI Technical Report No. 16. March 1991. \$4.60.
17. "Growth and Change in Malawi's Small and Medium Enterprise Sector." Michael A. McPherson. GEMINI Technical Report No. 17. June 1991. \$2.20.
18. "Burkina Faso Microenterprise Sector Assessment and Strategy." William Grant, Matthew Gamser, Jim Herne, Karen McKay, Abdoulaye Sow, and Sibry Jean-Marie Tapsoba. GEMINI Technical Report No. 18. August 1991. Volume One, Main Report, \$7.60; Volume Two, Annexes, \$14.20.
- *19. "Women in the BPD and Unit Desa Financial Services Programs: Lessons from Two Impact Studies in Indonesia." Sharon L. Holt. GEMINI Technical Report No. 19. September 1991. \$3.80.
20. "Mali Microenterprise Sector Assessment and Strategy." William Grant, Kim Aldridge, James Bell, Ann Duval, Maria Keita, and Steve Haggblade. GEMINI Technical Report No. 20. Volume One, Main Report, \$6.70; Volume Two, Annexes, \$13.00.
21. "A Microenterprise Sector Assessment and Development Strategy for A.I.D. in Zambia." Eric L. Hyman, Robert Strauss, and Richard Crayne. GEMINI Technical Report No. 21. November 1991. \$10.00.
22. "Bangladesh: Women's Enterprise Development Project Paper." GEMINI Technical Report No. 22. August 1991. [not for general circulation]
23. "Peru: Small Business and Employment Expansion Project Paper." GEMINI Technical Report No. 23. November 1991. [not for general circulation]
24. "A Country-wide Study of Small-Scale Enterprises in Swaziland." Yacob Fisseha and Michael A. McPherson. GEMINI Technical Report No. 24. December 1991. \$5.40.
25. "Micro and Small-Scale Enterprises in Zimbabwe: Results of a Country-wide Survey." Michael A. McPherson. GEMINI Technical Report 25. December 1991. \$5.00.

Technical Notes:

Financial Assistance to Microenterprise Section:

1. Series Notebook: Tools for Microenterprise Programs (a three-ring binder, 1 1/2 inches in diameter, for organizing technical notes and training materials) and "Methods for Managing Delinquency" by Katherine Stearns. \$7.50.
2. "Interest Rates and Self-Sufficiency." Katherine Stearns. \$6.50.

Nonfinancial Assistance to Microenterprise Section:

1. "A Field Manual for Subsector Practitioners." Steven S. Haggblade and Matthew Gamser. \$4.65.

Special Publications:

*1. "Training Resources for Small Enterprise Development." Small Enterprise Education and Promotion Network. Special Publication No. 1. 1990. \$9.00

*2. *Financial Management of Micro-Credit Programs: A Guidebook for NGOs.* Robert Peck Christen. ACCION International. Special Publication No. 2. 1990. \$19.00

*3. *The ADEMI Approach to Microenterprise Credit.* A. Christopher Lewin. Special Publication No. 3. 1991. \$15.00

Copies of publications available for circulation can be obtained by sending a check or a draft drawn on a U.S. bank to the DAI/GEMINI Publications Series, Development Alternatives, Inc., 7250 Woodmont Avenue, Bethesda, MD 20814, U.S.A.