Salt, Seasons and Sampans: Riverine Trade and Transport in Central Thailand

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SALT, SEASONS AND SAMPANS: RIVERINE TRADE AND TRANSPORT IN CENTRAL THAILAND

By
JAMES A. HAFNER
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University of Massachusetts

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INTERNATIONAL AREA STUDIES PROGRAM
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"What the Nile is to Egypt is the Meinam to Siam .... where labour has failed to redeem the soil, a vast, fertile, and feracious jungle has (yet) to be redeemed..."  
Bowring, 1857

I. Introduction

Since Sir John Bowring first recorded these impressions of the central plain of Thailand in the middle of the last century, time has unalterably changed the context of his account, though not entirely its accuracy. The 'feracious jungle' which covered much of the lower central plain in Bowring's time began to disappear under the plow of the Thai peasant farmer in the latter decades of the last century. By 1900 the landscape had been almost entirely converted to an intensive system of irrigated wet-padi production for export. The establishment and growth of this commercial agricultural economy has resulted in this region becoming the most productive, developed, and densely settled area of the country. The rapidly growing Bangkok Metropolitan Area, scarcely a shadow of itself in Bowring's time, dominates this commercial agricultural and industrializing landscape. However, the pivotal role of the 'Meinam' or Chaophraya river and other natural and man-made waterways in this region has been diminished only recently. Over this complex network flows padi, rice, maize, consumer staples, exotic fruits and vegetables, and an almost unending variety of goods and produce destined for Bangkok and other locations within the region. Since early in the 19th century this inland waterway network has occupied a central position in the economic, communications, and social interaction of the country. Boats of all shapes, sizes, and functions have plied these waterways to carry agricultural produce to Bangkok for export, to distribute food staples to the population, and to serve as the major communications and transport medium for the region. Not until the immediate post-war period did an expanding highway network, urbanization, and dramatic shifts in government investments in land transport...
network. Here we may turn to the flows of commodities in space and time, patterns of directional movement in commodity shipment and distribution, the changing composition of trade and commodity shipment on the waterways, and the links which may tie these patterns to settlements, productive activities, and other locational or areal phenomena. By seeking to compare and identify patterns, distributions, and connectivities in both space and time we can gain a fuller understanding of the dynamics of this system.

Four broad areas of pattern, distribution, and process are of immediate interest to us here. First, we explore some of the characteristics of the inland waterway network related to its early development, its use for trade and commodity flows, and constraints these characteristics impose on these activities. Secondly, we turn to the composition of local trade. Here our concern is with low-bulk, short-haul movements of consumer staples rather than the shipment of high bulk, long-haul movements of agricultural commodities, construction aggregates, and timber. Specific attention will be focused on six commodity categories typical of the local trade process; wood-forest products, consumer staples, fruit, vegetables, fertilizers, and miscellaneous cargoes. Our exclusion of the high bulk agricultural commodities (padi, rice, maize), construction aggregates (sand, stone, cement), and certain classes of forest products is based on the assumption that these commodities are seldom associated with the process of local trade. A third area of interest concerns the types of participants in the local trade system. That is, who is involved in local trade activities, what do their activities indicate about the structure of trade and its links to the local economy, and how do their activities fluctuate seasonally and spatially. Finally, we seek to incorporate the various patterns and processes of local trade into a general model of riverine trade dynamics.
The background for this study lies in an extended period of research in Thailand begun in 1966 by a team composed of personnel from the Department of Geography, University of Michigan (Ann Arbor) and Thai colleagues from the Applied Scientific Research Corporation of Thailand located in Bangkok. The task defined in this project was to complete a comprehensive survey of transport systems in Thailand. This included studies of the water, rail, and road transport industries which were completed in late 1969. The data base for this study comes from three primary sources: (1) a series of four census-surveys of trade and vessel movement on the inland waterways completed during 1966-1968 (2) over 500 interviews with owner-operators of vessels operating on the inland waterways; and (3) lock-passage records collected during the same period at all navigation-irrigation locks within the central plain. This aggregate data base was intended to provide the essential information upon which an analysis of the structure, organization, and operations of inland water transportation could be made.

It is evident from the foregoing comments that the data to be considered here is not current, and may in some respects be seen as a historical rather than contemporary record. To our knowledge this information represents the only comprehensive survey of inland water transport and trade to have been completed in Thailand. While over ten years have passed since these materials were collected, there are few substantive reasons which would lead us to question the contemporary accuracy of the broader patterns outlined here.

\[1\] The only other study completed on inland water transport in Thailand is a survey done by the Harbour Department in 1964. Its primary concern was with measuring commodity flows to and from Bangkok by vessel type and commodity. Much of this data is directly or indirectly incorporated in the study presented here. (see, Thailand, Harbour Department, Survey of Inland Waterway Transportation, Central Rivers Basin, 1964. Bangkok: The National Economic Development Board and The National Statistical Office (1966?))
There has most certainly been some continued erosion of the economic contributions of local trade, loss of commodities to the more competitive road transport system, and even changes in the volumes of commodity flows. However, we persist in our belief that the broad structural outlines of local trade, the activities of local traders, and the general patterns of commodity flows seasonally and spatially remain as representative today as they were almost fifteen years ago. We of course, assume full responsibility for any errors or misinterpretations which may exist in this study.
II. The Inland Waterway Network

Throughout the history of Thailand, water transportation has been a central factor in the development and coalescing of the kingdom. The historical pattern of site selection for the Thai capital represents a persistent preference for locations along major waterways. Early capitals at Chiang Mai and Sukhothai were located in the valleys and on the fertile flood plains of the Ping and Yom Rivers where crop cultivation and communication was easier. With time the capital migrated southward into the central plain, first to Ayutthaya in 1350 and later to Thon Buri in 1767. The present capital at Bangkok is thus one of a long list of cities which the Thai have founded based on access to water transportation and related advantages it provides for crop cultivation, trade, and commerce. Any thorough or critical analysis of the development of the inland waterway network within the central plain is well beyond the scope of our discussion here. However, a brief review of some of the major features of this network and their historical significance may serve to place our later comments in wider perspective.

Historical Foundations

The complex system of natural waterways and man-made canals which cover the central plain with almost grid-like precision was not always as extensive as they are today. As recently as the early 19th century, many of the larger canals which are major transport arteries today had still not been excavated. The relatively rapid growth of this network within the past 150 years has therefore, been in response to a number of dramatic changes in Thailand. While some disagreement still persists surrounding the precise reasons for the development of some canals, there is little doubt that a combination of economic, administrative, and trade factors were of importance. Bunnag (1967) indicates that some of the early works of canal dredging and construction done
in the 19th century were based on the need to insure stronger administrative ties between the central government in Bangkok and some outlying provincial centers. The remission of tax receipts and adherence to government policy in some of these peripheral provinces was apparently not entirely satisfactory and encouraged canal development to insure greater compliance with tax and civil policy.

Revenue generated from inland trade on the waterways was always a major source of income for the government. As early as the Ayutthaya period the government had an established system of land taxation and inland transit dues (octroi) which was most intensively applied in the central plain (Wales, 1934: 209). Padi lands were classified for taxation purposes according to land quality and the availability of water for irrigation. Land closer to the major river channels and with better soils was taxed at a higher rate than more distant land which depended primarily on precipitation for crop production. Inland transit dues or revenue collected from taxes on produce flowing from these agricultural lands to the capital was a major source of government income. The maintenance and dredging of many of the smaller canals which served these padi lands probably accounted for much of the early canal development in the area from Ayutthaya northward.

By the middle decades of the 19th century investments were beginning to be made in canals for developmental as well as strategic purposes. Johnston (1976) considers in some detail the impact of canal development on settlement and land development in the area east of Bangkok. Since the government only extended its administrative control over this region by the latter decades of the 19th century it is probable that the canals built here served to aid this development. Both Saen Saeb and Dan canals were dredged through the area east of Bangkok to the Bang Pakong River in 1837 and may have served to open
the area to settlement which did not begin in earnest until several decades later. Skinner also implies that civil unrest in Chachoengsao and Chantaburi in 1824 and 1848 may have spurred the need for the government to provide more direct access to the eastern margins of the plain for troop movements. Whatever the precise combination of reasons, canal developments in the area east of Bangkok during the middle decades of the last century undoubtedly had some impact on settlement, land clearance, and commodity flows to the capital.

After 1850 considerable attention began to be focused on expanding cultivated area and accessibility in the area west of the capital. The final decades of the century corresponded to a significant increase in area under-cultivation to wet padi as the frontier of commercial agricultural spread southward into the lower plain. One of the primary stimulants to this process was the demand for rice created by the opening of the Thai economy to the world market through trade treaties concluded in the 1850's. The process of land reclamation and development which had initially been supported by the growth of sugar production along the Tachin River now became increasingly sustained by the growth of wet padi cultivation. In 1857 Mahasawat Canal was completed as a link between the Chaophraya River north of Bangkok and the Tachin River further west, the first direct inland route between these two river systems. Land reclamation appears to also have been a major goal of some of the canal developments on the west bank of the Chaophraya during this period. Tanabe (1978; 40-82) has shown that many of the lateral canals and secondary systems of feeder canals constructed in this area actually served to reclaim and sub-divide land for settlement and cultivation. As sugar cane production declined in the 1860's these new canals aided the conversion of the area to intensive wet-padi cultivation. The Damnoen Saduak and Phasicharoen Canals which crossed this area in 1865 further improved communications between Bankkok and the Maekhlong River, stimulated an increased flow of commodities
to the capital, and opened further land for settlement and cultivation (Fig. 1). Where settlement and more intensive cash cropping had previously been confined to areas along the Maekhlong River by the lack of any more direct route to the capital, these new canals encouraged the spread of settlement and cash cropping inward along their channels. By the latter decades of the 19th century much of this newly opened land was increasingly devoted to intensive cash cropping for the urban markets in Bangkok and Thon Buri. The major thrust of canal construction and waterway development during the last half of the 19th century had been to improve overall connectivity between the various river systems, provide for better control and distribution of water for irrigating the growing wet-padi lands, to accelerate the flow of goods and produce to the capital, and to increase government revenues from transit taxes.

The growth of trade and commodity flows over this expanding network of inland waterways appears to be associated with the increasing development of a cash economy based on wet-padi production for export. Some trade had existed for many years as part of the movement of agricultural surplus and revenues to the capital. However, it is likely that these movements were primarily uni-directional and little trade developed based on the small rural population in the lower plain. As settlements grew, more land became devoted to wet padi agriculture and the volume and value of trade flow increased. The rapid expansion of the population of Bangkok and Thon Buri after 1850 also began to create a greater demand for basic food staples in the urban market. The development of areas of intensive cash cropping for the urban market along many of the canals west of the capital district served to meet this urban market demand. The expanding commercial economy also increased the potential market for consumer goods and basic food staples among the rural population.
Chinese merchants from Bangkok and tradesmen associated with the former tax farming system were probably the first to meet this demand. In the latter decades of the 19th century there began to appear on the waterways in the lower plain a group of itinerant trades, merchants, and middlemen who peddled consumer goods, food staples, loaned capital and extended credit, and bought and sold padi and other agricultural commodities (Skinner, 1957: 84). There are no records to indicate the number of such traders, but it is likely that they increased in number as the commercial wet-padi based economy overtook the entire lower plain. As local settlements grew outside of the capital district and established their own small commercial nucleus of merchants, more of these individuals became involved in servicing their immediate hinterland or market areas. Commodity flows also began to change in composition with the increased demand for simple building materials, tools, salt, household goods, and other staple needs. The capital and credit functions of local traders dealing with the farm population have continued to be a major activity, although rice mills probably cut into this service beginning early in this century. The persistence of the local riverine trader cum merchant throughout much of this century is probably attributable to the continued dominance of water transport as the primary means of communication and the structure of the peasant market economy.

A final era of waterway development in the central plain began with the closing years of the last century. In 1889 the first major step in the planned development of an irrigation system was taken when the government approved a concession for the development of a tract of land northeast of the capital. This concession provided for the development of some 240,000 hectares bounded on the west by the Chaophraya River, and on the east and south by the Nakhon Nayok River and Saen Saeb Canal respectively (Fig. 1).
Shortly after the concession was granted, dredging began for a network of canals which was to total 1,600 kilometers in length. This regular grid shaped pattern on the landscape is today one of the most readily recognized features of this otherwise homogeneous plain. Known today as the Rangsit Concession or Irrigation Tract, it represents the densest concentration of irrigation canals and navigable waterways within the lower central plain. However, due to the development of an extensive pattern of absentee landlordism, poor soils, and adverse living conditions the area soon became characterized by extremely high tenancy rates, poor agricultural production, and chronically low incomes.

At the turn of the century there existed throughout the lower plain over 3,700 kilometers of major waterways including rivers and navigation-irrigation canals. Although it is unclear what portion of this total was useable on a year-round basis, it is likely that over 60 percent of these waterways could be navigated by some type of boat throughout the year. By comparison, this same region had no first- or second-class roads outside of municipal areas, and less than 100 kilometers of dirt cart tracks which had only limited seasonal use. The almost complete dominance of trade and commodity flow in this region by water transportation is clearly reflected in the returns of the Royal State Railway for the year 1903/04. Of all rice exported from the country during this year, 97 percent of the total was shipped to Bangkok by water, and 93.5 percent of all other exports reached the capital by water (Carter, 1923; 230). Although there have been some significant changes in this pattern in the past 30 years, the inland waterway network in the lower plain continues to serve as the primary avenue for much local trade and commodity flow.
Framework for Analysis

The inland waterway system as considered here is composed of all navigable rivers and the network of inter-connected irrigation and communications canals located in the central plain. This system is most complex in that portion of the plain south of Ayutthaya. The river systems serve primarily as the major arteries for intermediate and long-haul movement of bulk agricultural produce (padi, rice, maize), construction aggregates (sand, stone, cement, timber), and some passenger flows. They may, therefore, be seen in one context as the broad framework defining the scope and extent of the entire system. Integrated into this network of rivers is an extensive system of canals serving both the irrigation, flood control, and navigation needs of the central region. In considering bulk commodity flows we would be primarily concerned, although not exclusively, with the river systems which channel most bulk commodity shipments to the Bangkok Metropolitan Area. The canal network represents the primary framework within which the more localized and small-scale activities of trade and marketing take place. The use of segments of the river systems in specific local trade activities or in the movement of specialized commodities is not, however, excluded. The general pattern of commodity flow and local trade over this entire network is influenced by a number of variables.

The general pattern of settlement distribution in the lower plain is one factor affecting the utilization of waterways for trade and commodity shipments. While several major urban centers (Pathumthani, Nonthaburi, Chachoengsao, Ayutthaya) are located along the river systems, the more predominant form of rural settlement tends to be either clustered or strip villages located along the canal network. The general pattern of retail trade is, therefore, more closely associated with the canal network than with the rivers themselves. In the upper section of the lower plain, above Ayutthaya, river bank settlements are more infrequent thereby limiting the potential number of trading centers.
and the market areas upon which many types of local trade depend. Secondly, the hydrologic characteristics of the rivers pose some serious navigational hazards for all boats, but especially for the smaller vessels associated with local trade activities. Seasonal variations in rates of discharge, current speed, channel configuration, and water levels tend to create rather hazardous navigational conditions for small boats. In many locations natural river levees place river bank settlements from 3 to 20 meters (10-70 ft.) above the water level of the river during the dry season. These conditions effectively preclude the use of rivers for many types of local trade which depend on 'door-step' retailing and marketing techniques. Thirdly, local traders tend to use smaller craft with very shallow draft which are not suited to the navigational conditions found on most rivers. Finally, various administrative constraints on vessel movements (locking fees, boat registration, speed) tend to encourage local traders to remain within discrete sub-segments of the waterway network (Plate 1 and 2). In those canals intended primarily for irrigation and flood control, restrictions on boat speed and even navigation by boat pose specific problems for many traders and merchants shipping specialized commodities.

The aggregate effect of these constraints on waterway utilization is to create a tendency toward compartmentalization of local trade. We may use this artificial grouping of trading areas as a methodological device in analyzing data on trade and commodity flow.

The definition of local trade sectors is employed here primarily as an analytical device to simplify data analysis. For our purposes we may identify five bounded areas or trade sectors of the waterway network as a basis for analysis (Figure 1). These sectors are:

I. **Rangsit Irrigation Tract** - the primary arteries in this sector are those comprising the Rangsit Canal system, bounded on the west by the Chaophraya River and the south by Khlong Hok Wa Sailang.
Plate 1 - Small barges exiting a navigation lock

Plate 2 - Cargo barges entering locks at the Chai Nat Dam
II. **Chengrak-Khlong Dam Irrigation Tract** - this sector includes three important linking canals between the Chaophraya River on the west and the Bang Pakong River system on the east (Saen Saeb, Samrong, and Prawet Burirom). The sector is bounded by the Gulf to the south, the Chaophraya on the west, and sector I to the north.

III. **Southwest Tidal Tracts** - the major canals in this sector are the Damnoen Saduak and Phasicharoen Canals which serve the interstitial areas between the Chaophraya, Tachin, and Maekhlong Rivers. The sector is bounded on the north by Mahasawad Canal and ends at the Gulf on the south.

IV. **West Bank Irrigation Tracts** - the more regular grid pattern of canals and rivers in this sector is bounded on the east by the Chaophraya River, to the north by Chao Ched Canal, and on the south by sector III.

V. **Upper River Sector** - includes the major rivers and a few canals north of sectors 1 and 4 and bounded on the south by Chao Ched Canal.

Sectors one through four are also accessible by a limited number of points, either navigation locks or direct-entry canals (Fig. 1). These limited access points tend to channel movements from within sectors to one of the major rivers or between sectors by means of a few selected entry locations. In most cases inter-sectoral movements tend to occur between sectors one and two or between sectors three and four. The fact that many local traders rely heavily on local supply sources for trade goods, results in infrequent movement beyond a specific sector of the waterway network. It should be emphasized, however, that this sub-division of the waterway network is more an analytical than conceptual device and exceptions to these patterns do exist.
III. PATTERNS OF COMMODITY FLOW

The process of local trade and commodity flow on the inland waterways can be initially characterized by two of its most prominent dimensions, spatial and seasonal or temporal variation. Spatial variation in local trade is manifest in the uneven distribution of various categories of trade commodities on the waterway network. Certain sectors or regions of the network may be associated with large concentrations of one or more commodities while other locations may exhibit only residual amounts of these same commodities. Temporal changes in the flow volumes and the composition of commodity flows are also typical of this process. That is, certain periods of the year find large amounts of some cargoes actually moving through the network, commodities which may later be found in very small amounts or not at all. These spatial and temporal dynamics in the trade pattern can be linked to such processes as agricultural production cycles, navigability, seasonal variations in credit and capital, and patterns of labor demand in the regional economy. The purpose of this section is to explore these dynamics by focusing on specific categories of trade commodities and the factors which affect their distribution.

The identification of specific commodities and even traders with local rather than long-haul trade is indeed a complex problem. However, we may initially define local trade as the process of distribution and marketing of basic consumer staples, carried out in low-bulk shipments by traders who depend on small-scale operations and low or marginal profits. We can therefore, exclude from these activities all long-haul bulk movements of grains (padi, rice, maize), construction aggregates (sand, stone, cement), and unprocessed forest products (timber). The fact that these commodities are usually shipped in large capacity boats (> 50 metric tons) often in strings of 5-20 vessels pulled by a tow boat, is further justification for their exclusion from the category
of local trade (Plate 3). When we add to these distinctions a higher diversification of cargo among local traders, pronounced seasonality in cargo movement, and a shorter average length of haul we can add further precision to our isolation of local trade as distinct from long-haul movements. Commodity categories typical of local trade include fresh (produce (vegetables and fruit), building materials (bamboo, lumber, nipa thatch), consumer goods (canned goods, patent medicine, tobacco, whiskey, household items, toys), consumer staples (fish soy, salt, dried spices, pottery), and miscellaneous items such as charcoal, fertilizer, betel nut. This list is of course not exhaustive, but representative of the diversity of locally shipped and traded items. Since the range of such items is obviously rather broad we will deal here with major commodity categories in terms of their spatial and seasonal distribution (see Table 1).
Table 1 - Average Daily Volumes of 'Local' Trade Commodities Recorded on the Inland Waterways, 1966-67

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<tr>
<th>COMMODITY</th>
<th>Unit - Volume</th>
<th>November %</th>
<th>December</th>
<th>January</th>
<th>February %</th>
<th>March %</th>
<th>April %</th>
<th>May %</th>
<th>June %</th>
<th>July %</th>
<th>August %</th>
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<td>FOREST PRODUCTS</td>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Charcoal</td>
<td>kgs</td>
<td>539,500</td>
<td>12.6</td>
<td>688,100</td>
<td>16.1</td>
<td>2,115,000</td>
<td>49.5</td>
<td>931,250</td>
<td>21.8</td>
<td>4,273,850</td>
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<td>Firewood</td>
<td>cu. ft.</td>
<td>6,300</td>
<td>4.0</td>
<td>19,600</td>
<td>12.4</td>
<td>106,400</td>
<td>67.5</td>
<td>25,300</td>
<td>16.1</td>
<td>157,600</td>
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<tr>
<td>Lumber</td>
<td>cu. ft.</td>
<td>3,550</td>
<td>7.0</td>
<td>16,500</td>
<td>32.2</td>
<td>10,900</td>
<td>21.3</td>
<td>20,300</td>
<td>39.6</td>
<td>51,250</td>
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<tr>
<td>Thatch</td>
<td>piece</td>
<td>725,050</td>
<td>26.0</td>
<td>615,000</td>
<td>22.1</td>
<td>525,000</td>
<td>18.9</td>
<td>919,000</td>
<td>33.0</td>
<td>2,784,050</td>
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<td>Bamboo</td>
<td>piece</td>
<td>63,000</td>
<td>4.8</td>
<td>633,000</td>
<td>48.6</td>
<td>159,500</td>
<td>12.3</td>
<td>445,800</td>
<td>34.3</td>
<td>1,301,300</td>
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<td>AGRICULTURE PRODUCE</td>
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<td></td>
<td></td>
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<tr>
<td>Vegetables</td>
<td>Total</td>
<td>60,810</td>
<td>12.1</td>
<td>41,500</td>
<td>8.3</td>
<td>143,340</td>
<td>28.5</td>
<td>256,560</td>
<td>51.1</td>
<td>502,210</td>
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<td>Vegetables</td>
<td>kgs</td>
<td>57,560</td>
<td>14.4</td>
<td>32,760</td>
<td>8.2</td>
<td>115,040</td>
<td>28.8</td>
<td>193,880</td>
<td>48.6</td>
<td>399,240</td>
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<tr>
<td>Potato</td>
<td>kgs</td>
<td>-b</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
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<tr>
<td>Mixed</td>
<td>kgs</td>
<td>3,250</td>
<td>6.5</td>
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<td>28,100</td>
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<td>-</td>
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<td>20.0</td>
<td>3,800</td>
<td>38.0</td>
<td>4,200</td>
<td>42.0</td>
<td>10,000</td>
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<tr>
<td>FRUIT:</td>
<td>Total</td>
<td>255,120</td>
<td>10.8</td>
<td>1,797,800</td>
<td>75.8</td>
<td>252,200</td>
<td>10.6</td>
<td>68,340</td>
<td>2.9</td>
<td>2,373,460</td>
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<tr>
<td>Banana</td>
<td>kgs</td>
<td>235,600</td>
<td>56.9</td>
<td>76,500</td>
<td>18.5</td>
<td>80,100</td>
<td>19.3</td>
<td>22,300</td>
<td>5.4</td>
<td>414,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pineapple</td>
<td>kgs</td>
<td>6,750</td>
<td>13.6</td>
<td>-</td>
<td>-</td>
<td>43,000</td>
<td>86.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>49,750</td>
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<tr>
<td>Sugar Cane</td>
<td>kgs</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2,500</td>
</tr>
<tr>
<td>Watermelon</td>
<td>kgs</td>
<td>-</td>
<td>-</td>
<td>1,703,300</td>
<td>100.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1,703,300</td>
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<tr>
<td>Mango</td>
<td>kgs</td>
<td>-</td>
<td>-</td>
<td>76,800</td>
<td>100.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Mixed</td>
<td>kgs</td>
<td>3,250</td>
<td>6.5</td>
<td>6,800</td>
<td>13.7</td>
<td>28,100</td>
<td>56.5</td>
<td>11,580</td>
<td>23.3</td>
<td>49,730</td>
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<td>Miscellaneous</td>
<td>kgs</td>
<td>9,520</td>
<td>12.4</td>
<td>11,200</td>
<td>14.6</td>
<td>24,200</td>
<td>31.5</td>
<td>31,960</td>
<td>41.6</td>
<td>76,890</td>
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<td>Salt</td>
<td>kgs</td>
<td>241,000</td>
<td>46.6</td>
<td>124,000</td>
<td>24.0</td>
<td>95,000</td>
<td>18.4</td>
<td>57,000</td>
<td>11.0</td>
<td>517,000</td>
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<tr>
<td>Pottery</td>
<td>kgs</td>
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<td>16.0</td>
<td>209,060</td>
<td>35.4</td>
<td>95,760</td>
<td>16.2</td>
<td>190,720</td>
<td>32.3</td>
<td>590,070</td>
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<tr>
<td>Fertilizer</td>
<td>kgs</td>
<td>120,000</td>
<td>43.2</td>
<td>75,000</td>
<td>27.0</td>
<td>37,000</td>
<td>13.3</td>
<td>46,000</td>
<td>16.5</td>
<td>278,000</td>
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<tr>
<td>Coconut</td>
<td>kgs</td>
<td>35,600</td>
<td>13.4</td>
<td>37,100</td>
<td>14.0</td>
<td>78,200</td>
<td>2.95</td>
<td>114,600</td>
<td>42.3</td>
<td>265,500</td>
<td></td>
<td></td>
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</tbody>
</table>

*Excluded from this table are the following commodities for which weight equivalents are not available: medicine, ice, oil, fish soy, whiskey, tobacco, fish, pigs, saw dust, ducks, manure (organic), chickens, prepared food and drink, and consumer goods.

b- Volumes of less than 2,000 kgs have been excluded from the table.

c- Estimated volumes of fruit or vegetables as a proportion of mixed lots of produce.

d- Includes assorted produce, betel nut, garlic, corn etc.
Forest Products

Second only to the major bulk cargoes moved on the inland waterways in total volume are various items classified as forest products. Included here are lumber, firewood, thatch (nipa), bamboo, and charcoal. Their importance is more closely associated with their utility as household staples and as energy sources for certain local processing industries than with their percentage of the total volume of commodity flows. Charcoal represents the largest single item in this group by weight and thatch (nipa) the largest single item by volume. (Table 1, col. 5). Considered individually, each item in this category represents several unique distributional and temporal patterns with linkages to both localized processing industries and the rural non-metropolitan population.

Firewood is not a basic consumer staple in central Thailand, most household cooking is done with charcoal, and thus it represents a specialized commodity. Its specialized character is tied to the processing of palm sugar by local refineries clustered in the southwest corner of the central plain. The collection and processing of palm sap from the Palmyra palm into liquid sugar is carried on in many small refineries located along the inland waterways in the coastal provinces southwest of the Metropolitan area. The largest single concentration of these refineries is in Muang and Amphawa districts, Samut Songkhram province. One specific area included over 180 small-scale processing plants located within a two kilometer radius of the junction of the Maekhlong river and khlong Maekhlong. These mills are often family owned and operated and have a daily production capacity of 2-3 tons of syrup. The most intensive period of production follows the end of the rainy season when sap flow is at a peak and processing conditions are best. Trees are tapped twice daily, morning and evening, and the sap is boiled in large vats heated by stoves fueled with firewood and sawdust. Firewood is the most expensive input in the processing cycle.
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The seasonal and spatial distribution of firewood reflects the relationship between production and input points for firewood and the location of palm sugar refineries (Fig. 2). The largest volumes of this commodity were consistently recorded within the waterway sector which includes the palm sugar refinery concentrations. An estimated maximum peak daily volume of 106,000 cu. meters was recorded on the inland waterways in May with considerably lower volumes during August and February. The lower volumes of firewood recorded during the remainder of the year are related to (a) shipment of major stockpiles in May, (b) poor cutting and drying conditions during the months of heavy monsoon rains from June through October, and (c) the seasonal availability of labor. Production sources and input points into the waterway network tend to be located around the periphery of the region. This pattern helps to explain why rather significant amounts of firewood were identified in sectors II and IV. Tidal nipa and mangrove forests along the Gulf and some areas of inland forest cutting to the east and west of the plain are the major sources for firewood recorded on the inland waterways. While some small amounts of firewood are used throughout the region, the largest concentrations of this commodity outside of sector III are seen as part of the same pattern of flow which supplies the sugar refineries and a small number of pottery plants in the same area.

The seasonal and spatial distribution of lumber, thatch, and bamboo represent three additional types of forest products shipped by water. (Fig 3). Each of these materials find uses in building, house repair, and similar construction activities. Since these activities represent the major uses for these materials we might expect to observe some association between their concentration on the waterway network and urban areas. And, indeed, sectors II, III, and IV which bracket the Bangkok Metropolitan Area and several other provincial centers, contain the largest concentrations of each of these commodities. Seasonal variations in total volumes appear to be associated with several
factors; (1) increased dry season construction activity, (2) lag times between cutting, milling and curing for timber and thatch, (3) the large amount of capital available for building and repairs following the padi harvest season, and (4) seasonal availability of labor for the cutting and stocking of thatch and bamboo. February through May is a period of low on-farm labor demand and in areas where thatch and bamboo resources are accessible to farm labor, this labor may be used to earn supplement income by cutting these materials (Plate 4 and 5). Sectors II and III of the waterway network are the most immediately adjacent to the source regions for these commodities and therefore record the largest volumes during the survey period.

Of all the forest products moved over the inland waterways, charcoal is the most closely associated with the character of local trade as it is considered here. Charcoal is a basic consumer and household staple for both urban and rural households throughout the country. Its primary use is as fuel for cooking. While historically it is likely that the primary sources for charcoal within the central plain were within the region itself, by the middle of the 20th century almost all charcoal used here was being 'imported' from provinces as distant as Korat, Prachinburi, Nakhorn Sawan and the southern coastal region. Major charcoal input points along the inland waterways can be found at Ratchaburi, Kanchanaburi, Song Pinong district in Suphan Buri province, and Prachinburi. Some of the less heavily settled provinces in the upper plain, Chai Nat and Uthaithani, have until recently been major source regions for charcoal consumed in the lower plain. The locations of these input points is reflected in the distribution of charcoal on the inland waterways.

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2In the immediate post-war period over 80% of the charcoal produced in Thailand came from the west coast of the peninsula between Malaya and the Burmese Border. This trade, like many other forms of early Tax farming, was primarily in the hands of the Chinese. (Thompson, V. Thailand; The New Siam. New York (1967), and Siam, the Royal Forest Department, The Forests of Siam. Bangkok: Bangkok Times Press, Ltd (1926).
Fig. 2 - DISTRIBUTION OF LUMBER AND FIREWOOD IN RIVERINE COMMODITY FLOWS

Fig. 3 - DISTRIBUTION OF THATCH AND BAMBOO IN RIVERINE COMMODITY FLOWS
Plate 4 - A trader of nipa thatch in the market along Damnoen Saduak canal, Ratchaburi province.

Plate 5 - Bamboo being retailed along the Rangsit canal in Pathumthani province.
The peak period input of charcoal on the inland waterway network was recorded in May when over 2,115,000 kgs. of charcoal were counted. This volume represents roughly 50% of the total estimated annual volume of charcoal movements by water. Significant volumes were also recorded during the remaining periods of the year which reflects the continual demand for this commodity and the method of its production and storage. The distinct seasonality in charcoal distribution is clearly a function of the regional climatic regime and its influence on the production process. Dry weather is important in charcoal production and therefore production builds during the dry months preceding the summer rains. Cured charcoal is also stored either indoors or under some protective covering which contributes to its wide availability year round.

Lowest seasonal volumes occurred in November (539, 500 kgs-12.6%) which follows the longest period of sustained rains and less than ideal curing conditions (Fig. 4). Seasonality in production and movement of charcoal is also complemented by a distinct distributional pattern. The largest single seasonal inputs were recorded in sector IV during the May survey period. This sectoral concentration is related to a large production/distribution center along Song Pinong canal in sector IV and the general patterns of shipment from the upper plain (sector V) through sector IV. This upper plain sector stands out quite clearly as a major secondary source region for charcoal being shipped to cities and markets in the lower plain. The slight delay in seasonal rains in the upper plain probably accounts for the large volume recorded in this area during August. A tertiary concentration of charcoal inputs as measured by our census was located in sector III, immediately south of Ratchaburi town. This is a major input point for charcoal produced in the peninsula and being shipped to the major markets of the central plain. In general then, the seasonality and spatial variations in charcoal concentrations on the inland waterways are linked to, (1) the character of the commodity, (2) influence of the regional climatic
Fig. 4 - DISTRIBUTION OF CHARCOAL IN RIVERINE COMMODITY FLOWS
regime, (3) locations of major production sites, and (4) the concentration of major markets (rural and urban) within the central plain.

Several broad patterns are evident in the distribution and locational variations of forest products as components of commodity flow on the inland waterways. Seasonal fluctuations in flow volumes are linked to climatic controls on the production and processing of most of these commodities. Peak input volumes occur during those months when production conditions are best and where these inputs are preceded by lengthy periods of dry weather. Secondly, concentrations of each of these forest products tend to be associated with those sectors of the waterway network which encompass the major urban and industrial complexes within the region. In these areas the pattern of flows support construction and building activities, the periodic repair of house roofs with thatch and bamboo, and small-scale processing industries utilizing firewood for fuel. Thirdly, the spatial variations in commodity concentrations between waterway sectors are influenced by the locations of primary production sites and/or input points for commodities produced outside of the central region itself.

Agricultural Produce

For even the most casual observer in Thailand the widely popularized 'floating market' in the Bangkok Metropolitan Area represents a microcosm of the color, diversity, and richness of the trade and marketing process. An almost unending panorama of exotic and common fruits and vegetables can be found among the commodity flows by water in many areas of the lower plain. Seen at one level this panorama is an index of the consumption and dietary patterns of the population in which fresh fruit and vegetables play a major role, second only to rice in total amount consumed. At a different level the varieties and distribution of agricultural produce shipped by water articulates the links between intensive 'market gardens' found in the lower plain
and the major urban markets. Capital intensive market gardening tends to monopolize the production of fresh produce for the metropolitan markets, although some redistribution from urban to rural areas does take place. Small-scale houselot gardens are the principal sources of fresh produce found in local retailing in nonmetropolitan markets. While truck shipments of fresh produce have diminished the traditional water transport monopoly on the shipment of this type of produce in the last 25 years, trade and shipment by water still accounts for between 50-60% of all marketed surplus.

Vegetables

The types of vegetables considered here as elements in commodity flows include a variety of leafy and stem vegetables (lettuce, cabbage, kale, cauliflower), tuber and melons (potato, pumpkins, gourds, squash), chilies, onions, garlic, betel nuts, and coconuts. Since many loads of produce are mixed lots of vegetables it is not possible to separate individual types of produce. These mixed cargoes are included in Table 1 under the heading of 'Mixed' produce. Chilies, onions, garlic, maize, and betel nut are listed as 'Miscellaneous' produce. Distinctions between movements to major markets on a wholesale basis and local retail trading can not be easily made from the aggregate data presented here. However, as a general rule, volumes below 10,000 kgs. represent local retail trade rather than bulk movements for urban distribution. Where these volumes are located within sub-regions of the waterway network which contain few areas of non-rice cropping they can be presumed to be elements of local trade. Conversely, an indeterminate proportion of large volume movements probably mask certain proportions of vegetables being traded locally.
Vegetables as a commodity category shipped by water totalled over 767,000 kgs based on estimates from the surveys. This total volume was unevenly distributed throughout the year (Table 1). Estimated peak volumes were recorded in August (371,160 kgs) with lower volumes in May (221,450 kgs). Seasonality in production patterns for vegetables is a major factor in the temporal shifts in their volume being transported by water. Although the production process continues throughout the year, the Seasonal harvests of some heavier crops like squash, gourds, and tubers adds significantly to the total volume being shipped in May and August. Crop production generally drops during the wettest months from June through October for many crops, thereby lowering the total flow volumes of vegetables recorded later in the year.

The spatial variation in volume of vegetables being transported by water is shown in Figure 5. Flow volumes in each period are heavily skewed toward sectors III and IV, a reflection of the general concentration of vegetable production found in these areas. Some of the oldest and most intensive areas of 'market gardening' producing chilies, maize, beans, and various leaf and stem vegetables are found in sector III. In recent years a dispersal of this 'localization of production' has taken place, contributing to significant volumes being moved through Sector IV. Recent shifts from water to road shipment for produce grown in Sector III have also diminished the amount of vegetables moving by water in this zone. Changes in land availability, population pressure, and transport services have also encouraged an extension of this type of vegetable production into areas within the upper areas of Zone V in the central plain. This fact is reflected in the large volume

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Fig. 5 - DISTRIBUTION OF VEGETABLES IN RIVERINE COMMODITY FLOWS

Fig. 6 - DISTRIBUTION OF FRUIT IN RIVERINE COMMODITY FLOWS
(31-60,000 kgs) of vegetables recorded in this sector during the August survey period (Fig. 5). For the most part, the recorded movements of vegetables in Sector I and II represent local distribution and marketing of these types of produce. Little production takes place in Sector II although the majority of vegetables grown in this area are increasingly moved by road rather than water.

The general marketing pattern associated with the flows of vegetables on the inland waterways is one which can be characterized as a series of dyadic links. The initial link in this process is shipment from producer to one of the major fresh produce markets within the metropolitan area. At this end of the dyad produce is redistributed in one of three subsequent linkages; directly to retail outlets within the city; to wholesalers within the city, or through a redistributive system to retailers outside of the metropolitan area. Non-metropolitan redistribution may use either road or water shipment, but normally terminates in retail sales at a provincial level market. Local retail trade in vegetables shipped by water is usually dependent upon purchases from provincial outlets or is conducted by local traders who buy directly from producers. Consequently, flows of vegetables in small volume (< 10,000 kgs) recorded in individual waterway sectors throughout the year are primarily examples of local trade.

Fruit

The pattern of trade and shipment of fruit on the inland waterways differs noticeably from those activities associated with vegetables. The variety of fruit crops grown in central Thailand is large, however, the number which are

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regularly found in cargoes being shipped by water are small. This fact can be accounted for by the higher unit pricing of fruit, the structure of the marketing network, and the tendency to use truck shipment for those types of fruit which are destined for export and/or are easily damaged. Included among the major fruit crops considered here are pineapple, banana, watermelon, mango, and sugar cane. A separate category of 'Miscellaneous' crops has been included where fruit forms a proportion of mixed lots of vegetables and fruits, and assorted types of fruit for which no separate identify volumes could be determined (Table 1).

The seasonal volume of fruit being shipped by water exhibits considerable variation. The largest estimated daily volumes were recorded in February which totaled 1,797,800 kilograms while the smallest volume of only 68,340 kilograms occurred during the August survey period (Table 1). While the differential between these two periods is indeed significant, it may be qualified by considering the composition of each seasonal flow. During the peak volume flow in February, 94% (1,703,300 kgs) of the total volume was made up of only one commodity, watermelon. A similar pattern of one crop dominance occurred in November when bananas represented 92% (235,600 kgs) of the total estimated volume of fruit being shipped by water. Many types of fruit are harvested seasonally rather than on a continually basis throughout the year and thus their contributions to total commodity flows are confined to specific periods. Watermelon tends to dominate flows during January and February and mango during May and June. Several of the fruit crops with high unit costs such mango, pineapple, durian, and grapes are increasingly moved by road, particularly where they are destined for export. Furthermore, substantial volumes of these and other fruit grown outside of the central plain but marketed initially through the metropolitan fresh produce markets are shipped exclusively
by road or rail. This is typical of oranges grown in the north, mango and star apple grown in the southeast, and jack-fruit, mango, and other types of fruit produced in the peninsula.

The evidence presented thus far suggests that seasonal variations in the shipment of fruit by water is accompanied by distinct spatial concentrations of this type of produce on the waterway network. Figure 6 represents the estimated distribution of fruit in riverine commodity flows by waterway sector. Considering the one crop dominance of some seasonal flows it is not surprising that Sector 1 in February contained the largest estimated concentration of fruit for any sector or survey period. Over 1,485,000 kgs of watermelon or 81% of the total estimated volume of fruit for this period was being shipped from Sector 1. This area encompasses the Rangsit irrigation tract which has become one of the major production regions for watermelon within the central plain. The seasonal shift in concentrations of fruit on the inland waterways to sectors III, IV, and V represents several important relationships between production points and seasonality in harvest. Mango and pineapple represented the two major varieties of fruit in produce shipments, both crops with harvest periods in late spring and summer. Large areas of production for these crops are located in sectors III, IV and V. During the November survey period bananas accounted for over 70% of all fruit shipped in sector III, one of several areas of significant production in the lower plain.

With the major exception of watermelon, a fruit crop with a lower index of localization, the spatial distribution of fruit on the inland waterways corresponds well with established production areas, particularly in Sector III. The marketing network for these types of produce share some similarities with the marketing pattern for vegetables. That is, direct producer-metropolitan market linkages tend to dominate the marketing and distribution system. Smaller volumes find their way into local trade through direct purchase from
producers or low volume sales to local riverine traders by provincial or district level dealers. Sectoral volumes of less than 10,000 kgs tend, as with vegetables to be indications of local retail trade flows. For much of the rural non-metropolitan population, however, fruit consumption is limited by its seasonal availability and markedly higher unit price. Lower prices tend to occur for locally grown fruit which are handled in small lots and sold primarily through local retail channels.

Other Commodities

Discussion to this point has emphasized the variety of commodities which comprise the largest proportion by volume of cargoes moved over the inland waterways. This list by no means exhausts the great variety of items which are transported and traded on the inland waterways. Three final categories of commodities warrant some attention; fertilizer, consumer staples, and miscellaneous commodities. Since these types of cargoes tend to occur in small amounts and their distribution is closely linked to seasonal dynamics in the rural economy we shall consider them together.

Among the many types of agricultural inputs used on farm holdings in the central plain, chemical fertilizers may be the largest volume. Organic manures, mixed soil dressings, bat guano, and duck manure are typical of the range of fertilizers used, and each is found within the commodity flow matrix. However, their volumes tend to be small and their distribution highly localized around certain areas of intensive cash cropping. The high costs of shipment, inadequate distribution systems, and difficulties with pricing have severely hampered the availability and use of chemical fertilizers. During the decade of the 1960's when imports grew dramatically it has been estimated that over 80% of all imported chemical fertilizer was used within a 250-300 kilometer
radius of Bangkok. Much of this was also probably moved by truck due to the inadequate distribution system, lack of marine insurance for water shipment, and the limited spatial range of fertilizer use. To the extent that this is an accurate impression of the shipment pattern, the data presented here portray local movements almost entirely and reemphasize the limited use of water transport for fertilizer distribution.

The largest estimated volume of fertilizer in commodity flows was recorded during the November survey period (Table 1). Since chemical fertilizers are normally packed in 100 kg bags, this volume represents only 1,200 bags of fertilizer, a small amount indeed. Lower volumes of fertilizer were recorded in commodity flows during the other periods of the year with many sectors of the waterway network recording no significant volume at all. When one puts this pattern in the context of the spatial distribution of fertilizers in commodity flows several conclusions become apparent (Figure 7). The occurrence of fertilizer in commodity flows tends to be concentrated in sectors I, II, and IV of the waterway network. Considering the apparent preference for road shipment and the low volumes which were observed on the waterways we may conclude that these residual volumes represent local distribution to individual farmsteads (Plates 6 and 7). Secondly, the prominence of fertilizer in Sectors I, II, and IV further implies that these movements are tied to the provisioning of wet-padi farmers since few areas of non-padi production are associated with these sectors. This conclusion is further supported by the fact that the boats carrying this cargo were in the low cargo load ranges (< 250 tons) and many had capacities of less than 5 tons. It is unlikely that any substantial changes in this pattern will occur in the future unless distribution systems are improved, larger volumes become available for domestic use, and prices remain within reach of the farm population. Until these changes take place water transport of fertilizer will continue to serve only as a means of local distribution and will remain dependent upon the more efficient road delivery system.
Fig. 7- DISTRIBUTION OF FERTILIZER IN RIVERINE COMMODITY FLOWS

Fig. 8- DISTRIBUTION OF POTTERY IN RIVERINE COMMODITY FLOWS
Plate 6 - Transhipment of fertilizer from truck to boats for local distribution, Rangsit canal

Plate 7 - Loading local farmers' boats with fertilizer in Thanyaburi, Pathumthani province.
Despite the increasing differentials in income and living standards between rural and urban areas in Thailand, domestic consumption requirements continue to include certain basic staples. Pottery and salt are staple items found in almost every household and many rural households rely on local riverine traders to provide these staples. In contrast to many smaller items such as spices, condiments, and cookware which can be readily obtained in local markets, pottery and salt continue to be marketed in many areas by local riverine traders.

Pottery is produced in Thailand in many shapes, styles, and sizes for domestic household use. The more common *ong* or 'Shanghai' jar used for water collection and storage is typical of this type of pottery and few rural households are without these essential items. The more decorative glazed 'Shanghai' jar is produced primarily in the vicinity of the provincial center of Ratchaburi and then shipped to locations without decoration as containers for fish soy and are shipped to fish soy plants located in Samut Sakhon, Samut Songkhram, and Samut Prakan (Plate 9). Another common type of pottery distributed by water is unglazed earthenware containers produced in several of the Mon communities along the Chaophraya river north of the Bangkok Metropolitan area. All of these types of pottery are frequently represented in the commodity flow matrix on the inland waterways.

The movements of both unglazed and glazed pottery exhibit distinct seasonal and spatial patterns (Fig. 8). While the total estimated volumes of these items in commodity flow varied from 95,000 kgs in November to over 209,000 kgs in February, they represented less than 4% of all commodity movements. The seasonal variations in flow volumes may be attributed to several factors. The February peak volume comes at the end of the annual rice harvest, a period when rural farm capital is probably highest and households are more capable of purchasing these jars. Rural household activity is also likely to be more localized around the houselot area so that riverine traders would have more direct access to
Plate 8 - Pottery traders at a local market on the Nan river

Plate 9 - A local trader of Shanghai jars in Minburi, Phranakorn province
their 'market'. The second peak volume of pottery movements comes during August at a time when rural credit levels are high and sales could be made on credit. Economic considerations rather than production conditions appear to be more important controls of the seasonality of flows of pottery. Mon potters are particularly active year round in the production and retailing of their pottery, especially where trade is carried out by boat.

The spatial variations in pottery distribution over the waterway network are considerably more uniform than for many other commodities (Fig. 8). Two marked departures from this rather uniform distribution surface emphasize large concentrations in Sector V from February through August, and the relatively lower volumes during May and August in all other waterway sectors. The former pattern suggests that seasonal improvements in navigation conditions enable pottery traders to reach the less accessible areas in the upper plain, and the possibility that traders remain during the dry months at fixed locations in Sector V until navigation conditions improved. The absence of any pottery in sector V during the period of better navigational conditions in November tends to confirm this conclusion. The low volumes of pottery in all other sectors of the waterway network during May and August appears to be a response to (1) shortages of capital within the rural economy and, (2) the concentration of rural labor in activities related to the wet-rice planting process. Considering the character of pottery as a basic household utensil not requiring purchase each year the general uniformity in its spatial and seasonal distribution is not surprising.

Foster (1972) in a recent study of the Mon pottery community at Pak Kret, has noted that Mon pottery production has declined over the last ten years due to loss of markets to more attractive glazed 'chinese' jars made in Ratchaburi, and to concrete jars and metal tanks. Mon riverine traders have also "assumed an important role in the distribution of jars made at Ratchuri in large Chinese-owned factories." (See Foster, B., "Ethnicity and Commerce" unpublished manuscript, 1972; 3-4.)
A second staple regularly found in local commodity flows is salt, frequently referred to as solar salt. Salt crystals are produced from the evaporation of sea water and consequently the primary production sites are along the immediate margins of the Gulf (Plates 10 & 11). Because the production process depends on solar evaporation, output tends to fluctuate with changes in climatic conditions. Estimated peak production occurs during the fall and winter months when longer periods of sunlight and limited cloud cover exist. These factors are reflected in the fluctuations in salt as a commodity on the inland waterways (Table 1). One might also expect to find distinct localization in the distribution of salt in the waterway network as a function of the localized area of production. This is indeed the case where sectors II and III which include the largest areas of solar salt pans recorded the highest volumes of salt in commodity flows.

In concluding this evaluation of commodity flows on the inland waterways mention must be made of the many varieties of mixed consumer goods, household staples, and manufactured items which do not show up clearly in survey data. Ice, fuel oil, whiskey, fresh and dried fish, poultry, pigs, and even patent medicines occur with considerable frequency in the commodity flow matrix. Most of these items occur in small volumes and may frequently be mixed with other commodities. This has made it difficult to isolate these smaller commodities in the context of the data presented here. They are, however, by no means less important. Small loads of block ice showed up in significant numbers during the May and August survey periods, the hottest times of the year when ice is in great demand. Locally distilled whiskey and a great variety of patent medicines were also evident in the commodity flow matrix during the February survey period. Both items may be seen as consumer staples and 'seasonal luxury goods' whose purchase is linked to the availability of capital among the rural population. Almost 45% of all patent medicine being traded by water was recorded during
Plate 10 - Solar salt beds along the Gulf coast.

Plate 11 - Loading salt for shipment by barge.
the surveys made following the rice harvest. The unique character of this
type of commodity and the mobile trader who handles it as a local trade good
will be consider further in the following chapter.

The preceding descriptions of the seasonal and spatial patterns of
commodity flow on the inland waterways have drawn attention to the complex
set of interrelationships which link process, location, and ecological struc-
tures. It should be clear at this point that no single factor explains either
the distribution or seasonality of any specific commodity type. Mobility and
accessibility, location of production sites, variations in demand and markets
all exert differing influences on the process of local trade and commodity flow.
We may now turn to a more specific consideration of the types of mobile traders
who handle many of the commodities we have discussed here.
IV. MERCHANT, VENDOR, HAWKER: A TYPOLOGY OF RIVERINE TRADERS

The real complexity of trade on the inland waterways only becomes apparent when one seeks to distinguish between the many participants in the trading process. Individuals using all manner of boats, carrying the exotic and common, handling a few small items to bulk lots of produce, and covering trade routes of five kilometers to several hundred can be found on the inland waterways. Time, distance, type of trade, degree of capitalization, and frequency of activities are but a few of the criteria which may be used to differentiate between types of traders. Our purpose in this chapter is to try and bring some order to the evident diversity in types of mobile riverine traders. To accomplish this we will first briefly consider the economic system within which local riverine trade is embedded and then turn to the development of a typology of traders.

Economic Foundations

The general structure of the rural economy in central Thailand is one dominated by the small-scale production of rice by peasant farmers to whom this grain is both the main food staple and primary source of income. Considerable cash-cropping of fruit and vegetables exists in some areas, yet these areas are relatively small and involve on a small proportion of the total rural farm population. Farmers are not self-sufficient economically, but depend on the cash income from the sale of farm produce to obtain many basic consumer staples. Internal trade and marketing of farm surpluses is dominated by the movement of these commodities through local dealers and processors (rice mills) to the primary market center in Bangkok. This large primate city serves as the focal point for the upward flow of farm produce through the central place hierarchy and is the source for the downward movement of manufactured goods and various consumer staples. The general orientation of transport networks
toward the metropolitan area also serve to focus trade and redistribution processes on this primary market center for the country. Since most marketing of agricultural surpluses focus on the metropolitan area, few local markets serve as important distribution centers for farm produce. In one sense then, a true functional integration exists between the rural farm economy and the dominant urban market center. However, the local village economy is limited in its ability to specialize in non-subsistence production because the farm goods they do not produce move rather unevenly downward from the dominant market center. The satisfaction of these needs is filled for some segments of the rural population closer to the large urban market by fixed suppliers in local markets and for others at greater distances by mobile traders.

Theoretically, as commercialization increases demand for goods and services rise, consumers will be willing to travel further to obtain goods, and the need for mobile traders will be diminished. Fixed market places will then arise to meet the demand associated with widening commercialization in the economy. Throughout the central region a variety of different sized fixed market centers already exist to meet these needs. However, high transport costs, limited population mobility, distinct seasonality in capital flows, and low rural incomes limit the ability of much of the rural population to satisfy their demand exclusively through these centers. For traders to meet the varying demands associated with these conditions and still reach a market which is sufficiently large to insure acceptable profits, their activities must remain mobile. Therefore, mobile riverine traders have evolved to serve segments of the rural population beyond the reach of fixed market suppliers. Stine (1962) has proposed that suppliers typically are mobile when the range of a good (distance consumers will travel to obtain it) is smaller than the suppliers threshold or minimum market required for their survival economically. Since rural consumer demand is low and seasonal in terms of the ability to pur-
chase goods, traders can function more profitably by acting as mobile suppliers. Their mobile activities also adds a distinct 'place utility' to the goods and services they offer to the rural population in both time and space. When rural capital is scarce and thus observed demand correspondingly low, the mobile trader can increase the place utility of his trade goods and enhance demand by making goods available to the consumer at the point of consumption. Several additional factors can be advanced to further clarify these conditions.

Shortages of capital are typical of the rural economy where income is based primarily on the seasonal harvesting and sale of a single crop of rice. Few individuals whether farmers, local merchants, or tradesmen have sufficient capital resources at any one time to control more than a limited amount of goods and resources. Under these conditions participation in local trade is divided among many small units whose entrance into the trading process is not inhibited by capital shortages, but rather encourages more people to participate. In many cases the alternatives for the use of free time(labor) are highly limited and thus opportunity cost remain low. Small or marginally low profits gained from local trade are preferable to no return for labor which goes unused. Similarly, part-time involvement in trade enables many participants to accept profits which would be unacceptable to more heavily capitalized full-time suppliers. Where other sources of income exist from farming, commerce, or wage labor the periodic trader can afford to operate irregularly, stock small volumes of goods, and handle a greater variety of 'convenience goods' whose demand may be low or seasonal. The fact that much local riverine trade occurs with a minimum of capital investment on the part of the trader also reduces the importance of

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risk as a factor in trading activities. Any potential losses which might result from shifts in market prices or consumer demand are minimized by the low levels of capital invested and the nature of the goods and produce which are traded. In short, local riverine trade is an appropriate adaptation to conditions of flexible consumer demand, limitations on capital, an uneven distribution of population, and the generally low opportunity costs faced by much of the rural population.

We should not leave these brief comments on the economic setting of riverine trade without noting the important social dimension of this process. For many seasonal and part-time traders social contact and interaction represents an important aspect of their activities. Visits with neighbors, kinsmen, and other members of the local community which take place as part of their trading activities were often cited as more important than any profits they might make. Indeed, these types of social contact may help insure that even the modest daily earnings they seek are obtained and in the process cement the likelihood of transactions at some future time. Likewise trust, an important ingredient in rural social systems but something lacking in dealings with outsiders, tends to reinforce community loyalties and the reciprocity in local trade activities. Dishonesty is hard to conceal and thus trade within a local community must meet the norms of group collaboration where restricted types of group sanctions could be applied. Furthermore, strong incentives exist to maintain harmonious trade relationships for the giving and receiving of credit, a critical need in most rural areas, is embedded in the stability of relationships between lender and borrower.

Under the general conditions described here of varying demand, utility of goods, threshold levels, and the social dimensions of reciprocity in trade one might expect to find different types of traders. A definition of these types and the major criteria used to distinguish them follows. We caution however, that this typology is at best only a preliminary effort and is subject to further study.
A Typology of Traders

It should be apparent from the previous discussions that types of individual mobile traders vary greatly. Differences between them are most apparent in the superficial features of types and capacities of boats used, seasonality of activities, goods and produce handled, and the spatial range of their activities. Underlying these features are several more fundamental criteria which link traders to the economic system in which their activities are embedded. And, indeed it is the basic structure of this economic system which determines the broadest characteristics of the separate types of riverine traders. In developing our typology three criteria stand out; capitalized value of trade goods handled, the character of demand, and the threshold population required to sustain individual traders. Capitalized value of trade goods represents the cash market value of goods stocked daily by any trader, an acceptable although not entirely adequate surrogate for market price. Demand is a measure of consumer need factored as a function of distance. As population densities decline with distance from a center (e.g. Bangkok), demand declines accordingly. When zero demand is reached, that point spatially indicates the maximum trade range for any specific trader. The minimum demand threshold for any trader will be the volume of sales (population density) corresponding to a definite spatial area which creates the minimum income required to support that trader. Therefore, mobile traders who deal in goods with a high demand level (consumer staples, prepared foods) which is consistent throughout the year can be expected to have relatively small trade areas. Movements over an area of 5 kilometers would not be too small for vendors of coffee, noodles or sweets. Those handling more specialized goods with higher unit prices but intermittent or seasonal demand would require a larger trade area (minimum demand threshold) to sustain operations. These relationships are represented graphically in Figure 9. One may note an initial similarity here to the concept of spatial demand cones as defined by
Berry (1967: 60-61). This similarity is at best superficial since we have replaced the concept of price on the vertical scale with capitalized value of trade goods. As distance from the center (0) or supply point increases, total unit demand as a function of population density declines. The slope of the line $c'$, $d'$ represents the reduction in demand with distance (horizontal axis) from the traders supply point.

Four broad types of mobile riverine traders are identified here and shown in terms of the cost, demand, distance relationships in Figure 9. Traders dealing in high value goods and produce whose demand is seasonally affected by available capital and the 'place utility' of those goods tend to require larger trade areas (populations). These traders are consistently those who are active throughout the year and have been termed 'full-time' traders. Capitalized value
of trade goods for full-time traders ranged from $20 to $125, and included such diverse items as consumer goods, manufactured products, patent and herbal medicines, fresh produce, pottery, and charcoal. The minimum trading range of this type of trader normally exceeds 100 kilometers. Trade items may be stocked at one or more points and a complete circuit of their pre-defined trade routes may take from 10 to 30 days. The 'store-boat' trader is a unique example of this type of full-time mobile riverine trader. The term 'store-boat' has been applied because of the similarity these traders share with fixed general merchants in the diversity of goods stocked (Plates 12 & 13). These mobile suppliers serve both the rural populations with retail sales and small fixed merchants in rural centers with wholesale sales. Service to the latter local wholesale market is based fundamentally on the limited accessibility of these centers by road. As road networks have improved and truck deliveries extended to more isolated communities in the central plain, mobile store-boat traders have experienced general declines in their sales volumes. Their continued survival as mobile traders in the future appears to be linked to the degree to which road services are able to penetrate into isolated markets traditionally served only by water transportation. Arrayed below the full-time store-boat trader are a number of smaller-scale suppliers dealing in fresh produce, charcoal, and limited types of consumer goods. These mobile traders handle lower value trade items, require lower capitalization ($20-$60), and operate over more limited trade areas. No firm figures are available to indicate the numbers of such full-time mobile traders, although they probably represent less than 20% of all participants in local riverine trade.

A second type of mobile trader occupying a lower level in the trading hierarchy is the periodic trader. Suppliers in this category tend to be active periodically rather than year-round. This type of trader differs from the full-time trader in several respects; (1) trade occurs randomly during the year, (2)
Plate 12 - A mobile 'store-boat' trader moored along Rangsit canal in Pathumthani

Plate 13 - An advertisement for batteries lures customers to this mobile 'store-boat' at the Chaophraya Dam, Chai Nat.
trading is combined with other occupations (e.g. wage labor), (3) capitalized values of trade goods ranges between $15 and $20, and (4) minimum demand thresholds can be met within a trading range of 40 to 125 kilometers. Goods and produce typical of this type of mobile trader include fresh produce, charcoal, coconuts, nipa thatch, bamboo, and very limited types of consumer staples (fish soy, condiments, cookware). Most periodic traders follow established trading circuits which may include dispersed rural populations and selected small market centers. However, the periodic character of their activities and lack of regular supply sources create a significant amount of redundant travel. In contrast to many full-time traders who reported profit margins of 3-5%, periodic traders often had profits of 15-20% after cost. The need to offset high operating costs caused by irregularity of supply sites and the variations in demand for some trade items may account for these higher profit margins. Rural demand for various commodities may be 'saved-up' during periods when goods are unavailable and thus encourage mobile periodic suppliers to charge higher prices when those goods become available.

We now turn to the final two types of mobile riverine traders which fill out our typology. Although no precise statistics are available we estimate that 'part-time' and 'seasonal' riverine traders comprise the majority of mobile traders on the inland waterways. Part-time traders are representative of those who may be active throughout the year, but never on a full-time basis day in and day out. The types of goods handled by this type of supplier include consumer goods, charcoal, and prepared foods. In many instances the activities of the part-time trader are extensions of commercial enterprises conducted at fixed shops in local markets. That is, local merchants using their fixed shops as a base will undertake mobile retailing by water on a part-time basis. Several factors may help to explain this pattern. The variability of rural demand throughout the year is influenced by seasonality in capital flows, immobility of rural farm populations.
during harvesting and planting seasons, and periodic needs for credit. By
developing short daily trade routes of 15 to 40 kilometers the part-time
trader can reach large segments of his immediate market which are less
mobile. Vendors of prepared foods also fall into this general category
for many of the same reasons. In several markets along Damnoen Saduak and
Phasicharoen canals local coffee shops subsidize entire fleets of mobile
vendors and hawkers selling prepared food, noodles, and coffee to a less
mobile rural population. These trade staples are low in value, high in
demand, and actively handled by part-time traders in areas of high pop-
ulation density. Under these circumstances minimum thresholds can be
reached in short distances and the spatial range of traders is relatively
short. Part-time traders also include members of the rural farm population,
often women, who regularly vend home-grown fresh produce in local markets.
In general then, the part-time trader is one who handles small volumes of
trade goods with high demand, but which are low in unit value and require
small threshold levels to satisfy basic profit requirements.

Our final category of seasonal trader is distinguished by the very
low level of capitalization of trade goods ( $2.00), abbreviated trade areas,
and distinct seasonal patterns in their activities. The vast majority of
individuals in this category come from the seasonally unemployed and underem-
ployed rural farm population and wage laboring class. Choices for the use of
their surplus labor during periods of slack on-farm labor demand are often
highly limited and seasonal participation in local trading provides a low-cost,
low-risk option for the use of their time. Since profit margins are generally
very low for this type of seasonal trader, minimum threshold requirements and
trade areas are also correspondingly low. Most typical of the activities of
seasonal traders are those associated with the hawking of prepared foods,
home grown fresh produce, coffee, noodles, and sweets. Large seasonal swings
in the numbers of active mobile riverine traders can be partly attributed to
the activities of this type of local trader.

The typology of mobile riverine traders we have outlined in the
preceeding pages is first and foremost a tentative statement. We have noted
that these broad groups of traders can be defined in terms of a selected
number of demand, cost, and distance variables. To this we have added the
periodicity of trade to lend a temporal dimension to our typology. In general
higher capitalization costs, longer demand cycles and higher threshold levels
for merchandise, and larger trading areas tend to be associated with the full-
time mobile trader. This type represents one end of a continuum based on the
periodicity of trade activities. The opposing pole on this continuum is associ-
ated with low capitalization costs, short demand cycles, abbreviated trade areas,
low threshold levels for merchandise, and low opportunity costs. The seasonal
mobile riverine trader has been characterized by these factors. Arrayed between
these two poles are part-time and periodic mobile traders whose activities are
embedded in variations of these demand, cost, and distance factors. The full
spectrum of mobile riverine traders is in one respect a microcosm of the struc-
ture and level of development of the rural economy in central Thailand. Trade
is a method of articulation between supply and demand, producer and consumer,
urban and rural, merchant and farmer. In a region where development has proceeded
in a segmented and selective manner, existing towns perform some of the trade
and supply functions typical of centers in a developed landscape. However,
the effective reach of these suppliers in central Thailand is limited by distance,
low wage and income structures, seasonality in consumer demand and purchasing
power, and the economic dominance of one large primate city- Bangkok. Mobile
riverine traders are therefore, able to function in areas beyond the limited
effective reach of fixed retail enterprises and where weaknesses in the economic
fabric of the region acts as incentives rather than disencnetives to mobile
riverine trade. As the frayed sections of this fabric begin to mend through structural change and economic growth, mobile riverine trade may increasingly occupy a position of declining importance. Indeed, evidence has already indicated that such changes are beginning to take place.
V. DYNAMICS OF LOCAL RIVERINE TRADE: A MODEL

We have reserved for a concluding discussion some consideration of the overall dynamics of the process of mobile riverine trade in central Thailand. Previous chapters have touched on the structure of the inland waterway network, various ecological and administrative constraints on mobility, patterns of commodity flows seasonally and spatially, the economic framework within which trade is embedded, and the types of mobile traders involved in the process of riverine trade. Throughout these discussions a number of common elements have continually reappeared. These recurrent elements form the basic functional parameters of the overall process of riverine trade. What remains therefore, is to place these factors in a more unified framework. The purpose of this final chapter is to set out in the form of a model, the structural and spatial dynamics of riverine trade. Like all models, however, ours is not unflawed. Simplicity in defining the complexity of reality is both a strength and weakness of our proposed structure. In abstracting such a highly complex system into a few basic elements we inherently lose precision. Fine details and nuances of the trade process are lost or suppressed. We make no effort here to rectify these flaws since our model is presented as an exploratory rather than definitive statement. However, we hope that this statement of the broad structure of the riverine trade process will make its complexity clearer and more valuable to those interested in this little studied aspect of contemporary Thailand.

The model of riverine trade dynamics outlined here is a multi-dimensional structure. It includes five dimensions corresponding to the major parameters of the riverine trade process: (1) time, (2) area, (3) volume, (4) intensity, and (5) capital-credit flows. Each dimension must not be seen in isolation from the others, but as one component of a set of complex inter-
relationships. The temporal\textit{(time)} dimension, measured in Figure 10 on the longitudinal axis, represents the seasonality of the trade process. As we noted already, variations in the composition and volume of trade flows, changes in the number and types of active mobile traders, and mobility on the inland waterways are all subject to seasonal variations. The areal dimension of the model\textit{(Trade Area)} is primarily concerned with changes in mobility and accessibility linked to fluctuations in water levels. There are also indirect ties between changes in the dimensions of the potential trade area and accessibility to supply points for some primary products, and the temporal changes in locational concentrations of commodity flows. Volume is represented in the model on the horizontal axis\textit{(Volume)} as a measure of the total amount of goods and produce which are moved by water during any specific time or period. The volume of trade flows vary with
time and changes in commodity availability, the plateau or plane on the horizontal axis. The extremes in width of this volume plateau fluctuate between the first and third quarters of the year. The number of active participants in riverine trade (Intensity) is illustrated by the elevation of the vertical axis above the horizontal. That is, the higher the vertical dimension of the model rises, the larger the number of active mobile traders. The slope of this vertical scale suggests the rate at which participation in trading activities rises or declines with time. Finally, we include capital-credit flows as a surrogate index for general levels of economic activity. In the regional economic context of rural Thailand, the maximum availability of rural capital (Assets) and Credit, indicated by the shaded segments of the volume plateau, are considered to be sensitive measures of the periodicity of demand and consumer purchasing power. The overall dynamics of the trade process can be noted by the magnitude of these separate dimensions and their juxtaposition to one another in time. Several brief interpretative profiles of these dynamics as represented in the model may help to clarify essential relationships in time and space.

The first quarter of the calendar year (Jan–March) represents a period of low intensity in mobile riverine trade activities. The volume of commodity flows during this quarter are the largest during the year and are dominated by the input of bulk shipments of padi and maize following the annual harvest. Local trade commodities comprise only a minor percentage of total commodity flow volumes (Table 1). Mobility as measured here by the size of the trade area is restricted by seasonally low water levels in most rivers and canals. Economic conditions also exert a significant influence on trading activity and consumer demand. The period of maximum rural capital availability during the year immediately follows the seasonal padi harvest. With rural farm capital at an annual peak there are few immediate incentives for participation
in seasonal trading. Local riverine trade is dominated during this period by the full-time and periodic trader dealing in relatively high value, seasonal demand goods whose consumption is linked to available surplus capital. Once the initial capital surplus dwindles and a new production cycle for rice approaches, low opportunity costs among the rural labor force exert stronger incentives for involvement in seasonal mobile trade. Seasonal riverine traders increasingly represent a larger proportion of the participants in mobile trade activities and the slope of trade intensity rises. The temporal, areal, volume, intensity, and capital dimensions of our model can then be seen to define the general status of mobile riverine trade at this time of the year.

The period of maximum trade intensity on the inland waterways occurs during the third quarter (July-Sept) of the year. Trade areas have expanded substantially as seasonal rains increase river discharge rates and elevate water levels in the canal and river system. Participation in mobile riverine trade rapidly approaches its annual peak as all types of traders become active. The ranks of seasonal traders are swelled by the temporary shift of some rural farm labor into mobile trade during the slack period of on-farm labor demand between planting and harvesting. The aggregate volume of trade flows are, however, relatively low with locally trade goods and produce comprising a larger proportion of the total. Prepared food, charcoal, thatch, vegetables, and coconuts dominate the commodity flow pattern (Table 1). Credit plays an important role in the type of trade goods handled during this period. With the primary source of rural income from padi harvests still unavailable for sale, consumers are more dependent upon credit to satisfy consumption needs. Consumer goods, household staples, and prepared foods are major types of rural consumer needs which are satisfied through sales on credit.

The integration and articulation between ecological and cultural
systems which is represented in this model of riverine trade dynamics provides an important perspective on understanding the complexity of this regional landscape. Although simplifying the more complex relationships in this manner has obvious disadvantages, it does help to isolate the essential structural elements of this trade and transport system. It also serves to emphasize some of the immediate implications which riverine trade and transport have for regional development and planning.

Prospect and Implications

The long range future of water transportation and riverine trade in central Thailand is clouded by many uncertainties. Questions of planning priorities, availability of investment capital, rising fuel costs, and the efficiency of the existing supply and distribution systems are but a few of the more elusive factors which may control this future. Although there is already clear evidence that some sectors of the riverine trade and transport industry are suffering from lack of organization, capital investment, and competition from land transport it is unlikely that these impacts will be felt equally at all levels. In many ways it is also important if not imperative that this traditional system continue to exist and be more effectively integrated into the overall trade and transport framework of the region. The continued need for the more specialized movements of low value, high bulk agricultural produce and construction aggregates can be most efficiently handled by a better organized and funded water transport industry. Until such time as major structural and spatial changes in the economic fabric of the country take place, many types of local riverine trade can continue to meet the consumption needs of large segments of the rural population in this region.

The most immediate and essential needs related to maintaining a positive role for water transport involve several areas. A significant
improvement in governmental investment for organizational and operational improvements in the system is a high priority. These investments should have an immediate impact on the long-haul movements of basic commodities. A second priority area should include greater integration of public and private sector activities in water transport. The government currently is responsible for only modest amounts of bulk commodity movement, but could improve the efficiency of these activities through more coordination with the private sector. Thirdly, integrated transport planning and investment is essential. Too much capital has been devoted to expanding land transport systems which are directly competitive with water transport and create a redundancy in services and areal coverage. While this idea may challenge the 'free-market' concept of open competition, Thailand has far to limited investment capital to expect the private sector to meet the developmental needs of the region. Greater integration in services would also enable those activities in transport and supply which are most cost effective to be retained. At the local level this would mean greater reliance on local trade to meet basic rural consumption needs, especially where alternative means of shipment are not available and their future development is not planned. However, if the local system of supply and distribution is seen as a function of the level of economic development it can be argued that ultimately it will be replaced as the regional space economy becomes more sophisticated. In the interim, judicious public and private planning could achieve a more effective, low-cost, and flexible framework for transport and trade. And, in the process minimize the inevitable human costs associated with the replacement of a traditional set of distribution technologies. In the long run this may also insure a more equitable share of developmental benefits to all.
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