

CORPORATE LAND-HOLDING AND AGRICULTURAL
EXTENSIFICATION IN EARLY MESOPOTAMIA

Barbara Ann Hall

Cuneiform texts from the early historic period in Mesopotamia document the existence of corporate groups, including large corporate families, temples, and the crown (e.g. Diakonoff 1969; Gelb 1979; Yoffee 1977). Such corporate groups have a long history in this region, and continue to exist in various forms today (Fernea 1970). It has been suggested (Adams 1974a; Fernea 1970) that corporate landholding is the most efficient means of controlling resources in this region; a large group can effectively control more land than can be worked by a nuclear family. Using both archaeological and historical data, this paper will demonstrate that there is evidence for corporate family groups in the archaeological record of agricultural populations in western Asia. Such household groups developed within an intensive agricultural system that expanded and "extensified" with time. Political efforts to intensify the system were made long after the establishment of complex states in Mesopotamia (Adams 1974a).

Movement from intensive to extensive agriculture is contrary to most ecological explanations of the development of complexity (e.g. Netting 1977b; Smith and Young 1972), which draw on the work of Boserup (1965). Boserup argued that extensive agricultural practices, such as slash and burn, were intensified under the pressure of population growth. Intensive agriculture is adopted only if population pressure is strong enough to demand the investment of more labor to obtain food. Netting (1977a) correlated intensification resulting from population pressure with changes in household structure. Intensive agriculture was found to be associated with the appearance of nuclear family households and the rise of complex society (Netting 1977b).

Another explanation for social complexity which employs intensification as a prime cause is that of Wittfogel (1957). In his "hydraulic hypothesis", Wittfogel argued that intensive irrigation in certain arid river valleys created organizational demands which required the development of a strong centralized authority, and ultimately the state. However, it has been demonstrated that maintenance and expansion of irrigation systems in these areas is possible on a local level, by individual tribes and landowners (Fernea 1970; Adams 1974a; Gibson 1974). According to Fernea (1970:37), the "extensive patterns of

decentralized irrigation agriculture" practiced by present-day tribes are better suited to the arid environment than the intensification brought about by the modern centralized government. In the past a similar pattern of intensification imposed by state-level governments tended to "weaken and ultimately destroy" agriculture in Mesopotamia (Gibson 1974:7).

Wittfogel's ecological model adopts a typological approach: a sudden technological advance prompts a leap into a higher level of organizational complexity. He ignores both the role of lower level units of organization, such as households, and the intervening steps between egalitarian villages and the state.

While his definition of the problem is simplistic, Wittfogel does point out the vital role of water in arid regions. Cultivation of grains whose natural habitat was above the 200mm isohyet for rainfall agriculture placed a premium on the availability of water. The organization of groups and their land and crops must have been oriented towards maintaining a reliable water supply. Adams (1974a) notes that "primary importance (is) attached to water, not to a particular area that might be cultivated with it." This is especially true for the southern alluvium.

Local conditions of soil, water and topography would have significant effect on organization at this time. These ecological conditions would affect the structure of the minimal economic unit, the household, defined as the unit that shares domestic tasks and allocates labor and resources (Bender 1967; Barth 1967; Gelb 1979). Organization for obtaining food and other vital resources would influence the basic units composing the society.

Environment

The alluvial plain of southern Mesopotamia is extremely low and flat, with a gradient of as little as 2cm/km. As a result, the lower reaches of the Tigris and Euphrates rivers flow slowly in braiding channels that may change course during the many floods. The silt and salt carried in these channels are deposited during flooding, causing a serious salinization problem. The area surrounding the river is marshy, but rainfall is low, less than 200mm per year (Redman 1978:27-30), making rainfall agriculture impossible. Almost no rain falls from May to October. The Euphrates, fed by the melting snows of Anatolia, achieves its maximum flow in April and May, with floods common in

early May, around harvest time (Adams 1981:3-5). An ill-timed flood could destroy a year's harvest. Crops for the main winter growing season are sown between September and December, while the river is low. To extend sowing after January and take advantage of the late spring flow would subject the crops to summer diseases and pests (Adams 1981:6). Given such a harsh environment, agriculture is very risky. Water is an unpredictable but critical resource.

The earliest farming villages are found in the piedmont region to the north. Here the elevation rises rapidly, and the somewhat greater rainfall supports grasslands and cultivation. The rivers flow faster and form deeper channels making canal irrigation impossible without pumps, but avoiding the hazards of salinization (Redman 1978:33-34). Dry farming is possible in some areas, but in this arid region yields are variable.

These environmental factors affect the location and distribution of settlements within the region. Agricultural practices take into account both environment and site location. In turn, farming technology influences site location and local ecology. Specific modes of land tenure act as intermediaries between agriculture and organization. Land distribution is most effective when it allows the group to use land most efficiently with available agricultural techniques.

Ownership or rights to land form the basis of the minimal economic unit, the household. This was certainly true in Mesopotamia, according to historic texts;

"In households based mainly on agriculture, such as the early Mesopotamian was, household stands for a primary unit of agricultural production." (Gelb 1979:3)

Gelb (1979:3) notes that the Sumerian term "é" (as well as the Greek "oikos", and similar terms in Akkadian, Hebrew, etc.), glossed as "household", actually cover a wide range of meanings. Social groups ranging from a nuclear family living under one roof to the members of a large estate are considered households. Gelb (1979) finds a wide but consistent range of meaning for "é":

a dwelling house, even a room
 a palace or temple, a family/clan, or a household
 (Gelb 1979:2)

This term thus refers to a unitary concept of a minimal economic landholding social unit. It is distinct from the

Sumerian "ir-ri-a", which refers to a family grouping.

During the historic period, the main landholding groups were the temples, the crown, and corporate extended family groups (Diakonoff 1969; Gelb 1979; Yoffee 1977). Corporate groups have been defined by Goodenough (1951:30-31) as "groups that function as individuals in relation to property". Hayden and Cannon (1982) have suggested that control over land by a large corporate group is indicative of scarcity of or competition over vital resources. In cases where individuals are unable to effectively obtain and control a key resource, corporate groups would be advantageous. The loss of a key resource often results in the reduction of the corporate group to nuclear family ownership (Anderson 1970; Pasternak 1968).

Netting (1977a:75) has suggested that large corporate groups are associated with long-fallow shifting cultivation where population pressure is absent. Nuclear families are associated with intensive agriculture, population pressure, and "a system of land exploitation in which (are combined) higher investment, continuous productivity, and scarcity" (Netting 1977a:76). Barth (1967) has shown that the structure of a household group is the result of group decisions regarding property control and the allocation of labor. The key to the existence of corporate households would lie in how to allocate labor and property most effectively in an area where water is scarce.

For agricultural groups in Mesopotamia, the key resource is water. While land is abundant, agricultural settlements in Western Asia from earliest times have been concentrated in areas where water is either abundant or can be manipulated. The concern of corporate family households in arid Mesopotamia would therefore have been the efficient control of water.

Bender (1967) has stressed that "household" is not a unitary concept. The term may refer to a family unit, a unit which shares and allocates domestic functions or a residential unit. The three may overlap, but not in all cases. Since in Mesopotamia "household" is considered separate from a family grouping (Gelb 1979), the latter two types are the most relevant. A corporate (i.e. property-owning) group would share some domestic functions, especially those relating to the management of resources. In addition, a certain amount of residential coherence is a vital aspect of corporate groups (Hayden and Cannon 1982:135), whether the group lives in one large house, contiguous houses, or another arrangement, this residential

coherence would most likely be visible archaeologically, mainly in domestic architecture.

The archaeological evidence from Mesopotamia literature suggests that the characteristic family structure and residential patterns had their origins early in the history of sedentary agricultural occupation. Documentary evidence from the historic era shows an interesting continuity with prehistoric sites, evidenced by the persistence of household patterns through time (Diakonoff 1969; Leemans 1975; Liverani 1975; Gelb 1979).

I suggest that the control of vital resources, and the possibility of unequal access to these resources may have provided the basis for the development of social inequality. The growth of stratification and complexity is tied directly to specific subsistence practices in a specific ecological setting. While the broad developmental process is similar to other early state societies, the contextual framework of Mesopotamia is unique.

Agriculture in the Neolithic: Nucleus Sites

The earliest settlements exhibiting evidence of cultivation are located in the northern Mesopotamian rainfall zone. Even in this early period, access to a controllable water supply appears to have been a primary consideration. Sherratt (1980a and b) has suggested that the earliest farming sites in Mesopotamia were located in zones with good soil and a high water table, such as the alluvium next to an oasis, river, or wadi. These sites, isolated by surrounding areas of less productive land, have been labeled "nucleus sites" (Allan 1972).

Many writers (e.g., Smith and Young 1972) have used Boserup's population pressure argument as a basis for explaining the development of agricultural populations. Sherratt (1980b), however, has noted that this argument assumes that the earliest form of agriculture was an extensive, long-fallow type (possibly slash and burn) which became more intensive with time. Sherratt (1980a and b) points out that this assumption is based on ethnographic analogy with tropical horticulturalists, who are said to use this "primitive" form of agriculture. Yet swidden agriculture is practiced in an environment which is very different from arid Mesopotamia. Sherratt suggests that slash and burn farming may be a later, specialized adaptation to the marginal rainforest environment. Early Mesopotamian farming, he suggests, probably would original-

ly have been concentrated on the best land, in sites such as Mureybit, Abu Hureyra, and others.

The earliest agricultural sites in Mesopotamia appear in the northern piedmont zone in the 9th millennium B.C. These sites were generally small with 20 to 50 households. There appears to have been much variability in occupation patterns during the ninth millennium. Transhumance practiced in agriculturally peripheral areas accounts for some variability. A greater degree of sedentism with less variability occurred in certain prime locations.

The ninth millennium High Zagros sites may have been occupied on a seasonal basis, as they possess only fragmentary architectural remains. For example, basal Ganj Daren (Smith 1972), dated to the 9th millennium B.C., has remains of circular or oval depressions. Smith suggests that these may indicate impermanent structures. Zawi Chemi Shanidar (Solecki 1981) also exhibits scanty structural remains from the 9th millennium. The same is true of Karim Shahr and Tell Asiab (Redman 1978: 83-84). On the other hand, ninth millennium sites at lower elevations in the Zagros yield evidence for more permanent occupation. For example, Tell M'lefaat is distinguished by "round, semisubterranean houses with well-marked floors" (Redman 19878:83:84).

Structural remains at nucleus sites on the plain, such as Abu Hureyra (Moore 1979), Mureybit (Cauvin 1977), and Beidha (Kirkbride 1967) are more permanent in appearance. Sherratt (1980b) has pointed out that these sites, along with Jericho, Bouqras, and others; are outside the rainfall zone for agriculture. All were watered by wadis, oases, or high ground water, and have evidence of sedentism. These sites show an increase in village size compared with earlier (pre-9000 B.C.) occupations, and are characterized by the construction of round huts. Later in this same period, a few multiroom structures appear, along with some distinction in structure type, such as the postulated "workshops" at Beidha (Kirkbride 1967). These sites --, Beidha, Abu Hureyra, and the others -- are considered "nucleus sites": large, more or less permanent settlements outside the natural habitat zone for grains, situated in isolated locations with reliable water sources.

When a population focuses around a particular site, a form of "pseudodensity" develops according to Bronson (1978). The artificial constraint causes the population to concentrate more on the food resources available at or near the site. Problems with access to and transportation of

other foods would eventually cause them to be neglected in favor of "oasis crops".

The oasis crops in these small sites (in the natural habitat zone) would have been extensive stands of wild grains. According to Hassan (1977), wild grain had very high yields compared to other resources. Hassan associated reliance on grains with increased sedentism, including greater use of storage facilities. Sedentism makes a group vulnerable in years when local resources are less productive (Hassan 1977: 600-1). Agriculture reduced this vulnerability, as did greater dependence on herding and a variety of other resources. In settlement with an investment in storage, this is done by enlarging the catchment area. The catchment area can expand for a limited distance, however, before sedentism is threatened. Thus, Hassan suggests, settlements began to divide and locate in areas with a variety of resources in a very small area and a good water supply, such as Beidha and Jericho. Abu Hureyra (Moore 1979) and Mureybit (Cauvin 1977) also fit this description. Abu Hureyra is located at the junction between the Euphrates floodplain and the open steppe, allowing easy gathering of resources from two close but very different environments (Moore 1979:67). Although irrigation using the Euphrates was not possible without pumps, small-scale irrigation may have been possible in the past using the now-dry Wadi Hibna (Moore 1979:68).

At these large sites, early cultivators began to reproduce stands of wild wheat. Flannery (1973:307) has stated that the replacement of the local flora with a stand of wheat can be accomplished within one year. Thus, cultivation of an extremely productive resource could be accomplished on the oasis sites quite easily. Given numerous nearby resources and a secure water source, an even greater degree of sedentism was possible. There were therefore more advantages to sedentism than to dispersed settlement. The attraction of a focused site may encourage intensification and possibly local population growth (Cowgill 1975).

Sedentism is therefore a critical variable. Cultivation and the ultimate domestication of crops took place at large sedentary sites located on well-watered land, such as Beidha and Abu Hureyra. At many sites, evidence for sedentism is seen in a shift to quadrangular, more permanent structures. The use of storage pits and the tendency to rebuild and repair houses seen at sites such as Ain Mallaha (Redman 1978:73-76), suggests an increased investment in property. The fortified site of Jericho, watered

by a permanent oasis (Allan 1982), is an example of a nucleus site that attained an unusually large and concentrated sedentary population in a prime location.

The key factor in the success of these nucleus sites is productivity. The site must be so productive that the population neglects more distant resources and remains sedentary, dependent on cultivated grain and other local resources. Productivity may be defined, depending on the specific case, as "productivity per unit of available land, productivity per unit of land under cultivation, and productivity per unit of labor" (Culbert 1974:49). These early farming sites were highly productive in terms of yields per unit of land and in terms of labor.

The introduction of new grains would have changed the local ecology. Helbaek (1969), using data from the Deh Luran plain in southwestern Iran, has shown that the introduction of domesticated plants changed the ecology of the native plants; areas formerly occupied by other economically important plants were taken over for cultivation. A similar process would have occurred in the early nucleus sites, when grains were introduced outside their natural habitat. In sites with reliable water supply, the new plants took over the local environment. The population then focused on these new, highly productive cultigen. The earlier process of growth and demographic "pseudodensity" would be repeated at these nucleus sites. Only after the best locations were occupied would expansion into the rest of the plains have occurred. This most likely happened during the 5th and 6th millennia B.C. (Sherratt 1980b:319).

Expansion and Extensification

Netting (1977a:79) has noted that

"Higher population density is positively associated with the presence of such intensive methods as short or absent fallows, ground preparation using grids, mounds, or tillage, erosion and water control, and fertilization. These measures in turn are directly related to land holding; individual tenure occurs in all societies in which agriculture is permanent or the fallow period is less than six years, whereas group tenure is found with longer fallow periods."

Agricultural intensification resulting from population pressure is associated with an emphasis on the nuclear family as the economic unit, the development of the concept

of private property, and ultimately the promotion of social stratification (Netting 1977b).

In Mesopotamia, however, the use of hoes, plows, and irrigation served as a means of agricultural expansion rather than intensification. As agricultural populations expanded from nucleus sites into the marginal plains, vast areas of land were opened up for cultivation. Hoes, plows, and irrigation were used to make the land arable. Thus, the establishment of irrigation agriculture in the southern alluvium in the Ubaid period (4500-3500 B.C.) was the culmination of a long-term process of "extensification".

Intensity of agricultural production is nonetheless a major determinant of the structure of the basic economic unit. The early "nucleus sites", which were extremely fertile and productive, would be farmed intensively, with almost no fallowing. Plots of land at these sites could have been worked by nuclear or extended families. The presence of small round huts at such sites implies that households may have been fairly small. However, as Hassan (1977:596), has suggested, a large group would have been required to efficiently harvest the huge stands of wild wheat in the natural habitat zone during the brief time they are available. Thus, village cooperation and/or possibly large households could have been important from very early times.

As previously stated, harvesting a variety of local resources would help to buffer the vulnerability caused by reliance on one principal main food source, (Hassan 1977:600-11). However, at nucleus sites, where the population was concentrated, this vulnerability would increase. As the cultivation of grains superceded the use of local game and plants, reliance on domesticates would have become even more important. A succession of bad years and the resulting uncertainty could force a population dependent on domestication to expand. In Mesopotamia, this expansion occurred when populations began to move into less favored areas of the plains (Sherratt 1980b). While these new sites were on less productive land, settlement could be more flexible, allowing for expansion and adjustment in the face of uncertainty.

As settlements relying on rainfall agriculture expanded into these marginal areas (Sherratt 1980b) both farming practices and village organization had to be adjusted to be effective in the new ecological setting.

"Developments beyond (the) initial stage of cultivation involved adaptation to drier habitats which required more soil preparation and the use of fallowing or systematic rotation...One of the first major steps in this direction was the extensive appearance of sites on the deep brown soils of the moist steppes of northern Assyria in the 6th and 5th millennia B.C....Such cultivation would require extensive soil preparation with the hoe, a fallow of one to four years and probably cultivation moved out of the zone of abundant ground-and surface-water."
(Sherratt 1980b:319)

In the less productive plains, much of the land would have to be kept in fallow to maintain its fertility. However, since land was not restricted to a small "nucleus" zone, more land was available for cultivation. If improvements were made to the land, an overall increase in productivity would still be possible.

Thus, in order to maintain productivity, a system that was land-intensive, became, with expansion, land-extensive and labor-intensive. Land rights were affected by this system, as large parcels of land were owned and worked by corporate groups. Some land could thus be kept in fallow to maintain its fertility, with enough remaining under cultivation to provide an adequate yield for the group. Enhanced productivity could best be realized through this type of ownership.

Both Sherratt (1980a and b) and Allan (1972) argue that the occupation of nucleus sites and the expansion into the marginal plains were separate historical stages. In fact, the occupation of nucleus sites persisted beyond the time of expansion into dry farming areas. Groups in well-watered areas were able to continue practicing intensive, highly localized cultivation, while those on the plains practiced land-extensive, labor-intensive cultivation.

Occupation of prime agricultural land followed by expansion into less productive areas was a recurrent pattern in the spread of agrarian populations in Western Asia. For example, in the Sinjar Valley of northwestern Iraq, Merpert and Munchayev (1981) have found that the earliest agricultural occupation (circa 8000 B.C.) consisted of a fortified site (Tell Maghzalia) with an "uninterrupted and compact plan of...settlement on the edge of the valley" (Merpert and Munchayev 1981:3). Remains of single-grain, double-grain, and dwarf wheat, as

well as multi-row barley, suggest well-developed cultivation at this site. Unfortified sites and a hierarchy of settlement do not appear in the valley until the late 7th-early 6th millennium.

The late 6th millennium occupation of the alluvial plains represents the first appearance of agricultural settlements below the 200mm isohyet, the limit for rainfall agriculture. Widespread use of canal irrigation became necessary for the first time in these central Mesopotamian sites, which contain Samarran pottery. Large-group corporate land tenure would be especially advantageous in areas where irrigation systems were developing. Work on the local level would be needed to maintain the canals, and a strict fallow cycle would be necessary to prevent salinization of land watered by the canals (Adams 1981). Family units are evident at sites such as Tell es-Sawwan (Yasin 1970; Abu el-Soof 1968; and others), if the large multi-room T-shaped buildings of Level III can be interpreted as family dwelling. At Yarim Tepe I and other Hassuna (middle-late 6th millennium BC) Sinjar sites, Merpert and Munchayev (1981) noted compounds enclosed within precincts, which they suggest, "document economic cells that had become separate within the community." These "cells" may have been large families that controlled resources. Large multiroom houses are also found at Choga Mami, where there is evidence of compounds enclosed within buttressed walls (Oates 1969). At Choga Mami and, apparently, Sawwan, houses are built continuously on or within the same walls (Oates 1969; Oates 1973). Oates infers the existence of extended households and rigidly observed property rights at these sites. The concept of property rights may be further reflected in the appearance of stamp seals at Hassuna and Samarra sites, and potter's marks on Samarra pots (Oates 1972; 1973). Samarran sites are notably larger than previous sites, and are the earliest known irrigation sites in Mesopotamia. They also show the earliest and strongest evidence for the presence of large property-owning groups.

There is convincing evidence for the existence of irrigation at Choga Mami during the Samarra period. This includes evidence for small-scale channel, possibly fan, land irrigation during a considerable period of the Samarran occupation and a much larger lateral canal before the end of this period (Oates and Oates 1976:132). Oates and Oates indicate the position of this site, which sits in a triangular area between two rivers, creates a kind of "miniature Tigris-Euphrates floodplain". This floodplain is much better drained than its larger counterpart, permitting early development of advanced irrigation

system, while escaping many of the ecological hazards of the southern alluvium.

The evidence for irrigation at Sawwan is less convincing than that at Choga Mami, since only floral evidence is available. However, Helbaek (1960; 1964; 1969) has shown that genetic changes resulting in increased linseed seed size and the replacement of two-row barley with the naked six-row variety indicate irrigation was practiced. Irrigation assures a reasonably secure water supply at critical times in the growing season, resulting in a general increase in grain size. Some researchers (e.g., Oates and Oates 1976) dispute this interpretation. In any case, since Tell es-Sawwan is located below the 200mm isohyet, irrigation would have been necessary to support the large population that the archaeological remains suggest.

The role of agricultural practices in shaping social organization has been most apparent on the southern alluvium, specifically in historic Sumer. Evidence for occupation of the alluvium prior to the appearance of farming villages in the early Ubaid is scarce. Similarities in the ceramics and the temple sequences between Samarran and southern alluvial Ubaid sites (Oates 1973), suggest that there were close cultural ties between the occupants of these sites.

Parallels between Choga Mami and the later southern alluvium sites are seen in both their physical and their social development. On the alluvium, irrigation began along essentially natural channels: "Most communities were placed along braiding or anastomosing channels that are the natural regime of streams in floodplains, rather than (on) axially branching, large scale canal systems" (Adams 1969:115).

"...linear alignments of sites suggestive of lengthy, wholly artificial canalization are at best very rare. Irrigation must have been accomplished by damming the natural distributaries and then conducting water to the fields by relatively small-scale canal construction and localized flooding" (Adams 1981:245).

The elevated stream bed allowed for a simple form of irrigation. Shallow cuts in the levees released water onto the levee backslopes, where it could be taken off for irrigation (Adams 1981:7-8). Farming, therefore, was concentrated along the levee backslopes of these water-

courses, leaving much potentially arable land open for pastoralists.

The tendency of channels to move with floods made the establishment of permanent farming settlements hazardous. Farmers attempted to straighten out and stabilize channels in order to protect their water supply. In time, the channels became more artificial in appearance; however, an elaborate artificial system requiring centralized control was not established until the Sassanian period (A.D. 226-640).

Adams (1960; 1966; 1969; 1974a and b; 1981) has repeatedly emphasized that the appearance of a large permanent population in the southern alluvium was accompanied by an extensive form of agriculture. Adams has pointed out that the nature of the hydrologic regime in Mesopotamia made intensive farming virtually impossible. Despite the use of irrigation, the land must today be fallowed every other year, and this was probably the case in the past (Adams 1974a). In historic times, and no doubt before, fields were irrigated three or four times a season (Kramer 1963:67; Adams 1981:5). However, unpredictability of water flow would lead farmers to use as much water as possible every time they irrigated. If the water was not drained properly, the resulting over-irrigation could promote salinization. Smaller, more frequent waterings, which could have reduced the salt problem, were not possible since they required that water be kept at adequate levels for users in all parts of the canal system (Adams 1981:245)

The tendency to overirrigate when watering would give an advantage to users on the main channels or at the heads of branch canals (Adams 1974b). They could use more than their share of water, and even divert the channel away from neighbors. Because the channels carry silt, which is most heavily deposited at the head of main branches where the flow is fastest, the canals must be dug out and maintained each year. If this is not done, the neighbor downstream will not receive a fair share of water.

According to Adams (1974b), the need for local canal maintenance and the competition between upstream and downstream cultivators would give an advantage to an economic unit that "embraces a substantial community of interest with more or less assured ties to the land" (Adams 1974b:4). Adams (1974a and b) has cited Fernea's (1970) ethnographic work in southern Iraq as a modern instance of the same phenomenon. Fernea has suggested that larger social groups, such as the tribe or extended family, are the best land-owning units for this type of environment.

"Tribal, temple, state, or absentee landlord tenure may be viable alternatives in different historic circumstances, but in any case there are disproportionate advantages attached to large landholding units" (Adams 1974a:2).

Thus, the trend toward land-owning by extended family units would be enhanced by these new advantages. The earliest Ubaid settlements are widely dispersed, but their size and sophistication indicate a successful adaptation to the alluvium (Adams 1981:59). In the Uruk period, (3500-3100 B.C.) sites were located along canals, and clustered near certain major sites. This pattern is like that of the north in earlier periods, when the best land was occupied first and less productive land colonized later. In the south the best land was defined in terms of reliability of its water supply. Here, agriculture would have been extensive rather than intensive from the start. With a strict cycle of one year cultivation/one year fallow, a group, which could own and work a larger plot of land than a nuclear family, could obtain greater productivity from that land. Since irrigation enhances productivity, large units owned by corporate groups would further increase in value.

Historic Evidence

Cuneiform texts confirm the existence of corporate groups in Mesopotamia. Early Dynastic (ca. 2500-2400 B.C.) documents from Lagash (Diakonoff 1969) record purchases of land by what are inferred to be patrilineal extended families, where a representative of the family sells part of their communal land. There is some evidence that communal family ownership persisted until the Old Babylonian period in Sumer (1900-1600 BC) and until somewhat earlier in Akkad (Leemans 1975). It is also seen as far north as Syria in the 2nd millennium (Liverani 1975).

Temple and crown land holdings are similar to family holdings in that a single institution organizes work on the land and redistributes the returns (Falkenstein 1974; Yoffee 1977). In each case, the large group controls the land for its value as a capital investment as well as for its subsistence value. Temple land comprised arable land, gardens, forest, marshlands, and pasture land (Falkenstein 1974:7-8). Arable land provided subsistence for temple personnel; other temple lands provided revenue from such products as fish and cattle (Falkenstein 1947:7-8).

Linton's (1933) studies in Madagascar suggest that, under conditions of intensive cultivation, plots of land may acquire different values. These tend to be based on cumulative improvements, the availability of water, and the value of cash products from the land. In Mesopotamia, water, a scarce resource, turned improved plots of land into capital investments.

Cultivation of cash crops also increased the capital value of the land. The variety of ecological zones in the alluvium provided a variety of settings for specialized cultivation. For example, date palms, which were domesticated by the 4th millennium BC (Zohary and Spiegel-Roy 1975), grow well in the southern tidal area and along irrigation canals (Oates and Oates 1976). Palm trees give a long-term investment value to the land, since the trees grow slowly and yield for many years. A palm grove thus becomes an investment in the land, which must be preserved from generation to generation. Palms provide both subsistence products and potential cash crops such as timber, rope fiber, and dried dates.

Gardens also appear to have been extremely valuable plots of land. Texts from Girsu-Lagash (Leemans 1975) and from Nuzi in the 15th-14th centuries BC (Zaccagnini 1979) describe gardens as small specialized areas of valuable land. Gardens were kept separate from fields and appear to have been grouped with orchards immediately outside settlements (Zaccagnini 1979). By the 19th century BC, cuneiform documents show that the practice of land leasing had become common, and garden plots commanded a higher rent than grain fields (Leemans 1975).

Linton (1933) has shown that changes in the value of land in Madagascar led to the breakdown of group cohesion and to land ownership by nuclear families. In Mesopotamia a slightly different process of land division occurred. As the value of land became less equal, the communal landholding system had to adjust. Temple holdings could be subleased into plots of differing value, with the land worked by different people. Much of the temple land was cultivated to provide products for the temple redistribution system. Other portions were given to temple workers on a nonhereditary basis or leased in return for a portion of the yield (Diakonoff 1969; Falkenstein 1974). The system was very flexible and could easily accommodate adjustments in land tenure and value. Communal family holdings were also affected by changing land values. Since there is no direct evidence of the size or value of the

land cultivated by each individual (Leemans 1975), it is difficult to determine how division of land occurred. There is, however, evidence that the status of land was changing. Diakonoff (1969) argues that communal family land was often bought up by rulers and functionaries. By the 2nd millennium, communally-owned land was becoming increasingly individually-owned, according to Diakonoff (1969). This land could then be leased to others to work (Leemans 1975).

The emergence of privately-owned land is associated with Adams "second configuration" of irrigation patterns in Sumer (Adams 1981:245). Population was rising in the 3rd, 2nd and 1st millennia BC, while the number of channels was being greatly reduced. In place of the narrow, linear arrangement of settlements along numerous channels seen in the Uruk and Jemdet Nasr periods, a wide belt of cultivation developed along certain watercourses. This new intensification occurred as "an outgrowth of many centuries of small-scale modifications and improvements" (Adams 1981:245) to assure and increase the water supply; it was not a planned systematic process. Social demand, including the need for a secure water supply, for better transportation of goods by the widening of canals, and for cash crops prompted agricultural intensification. However, the long-term ecological demands of the region could be defied for a limited period of time. The ecological system failed even before the Mongol invasion dealt it its death blow in the 13th c. AD (Adams 1974a).

Summary

Beginning in the Samarran period, and possibly earlier, corporate family landholding appears to have been important in Mesopotamia. The necessity of maintaining a strict fallow cycle placed a premium on land ownership by a large corporate group (Adams 1974a). This form of landholding has been associated in Mesopotamia with a land-extensive, labor-intensive irrigation system, which helped to prevent salinization (Gibson 1974).

The growth of farming systems in societies becoming more complex through time has generally been described as a development from purely extensive to purely intensive practices (Wittfogel 1957; Boserup 1965; Netting 1977b; Smith and Young 1972). Irrigation in itself is generally viewed as a form of intensification. Since extensive slash and burn agriculture requires less work than intensive practices, only strong pressure would force the population to do more work to raise food. However, any agricultural

practice must be adjusted to accommodate the ecological system in which it exists. In Mesopotamia, where efficient irrigation requires a fallow cycle as strict as or stricter than any slash and burn system, irrigation is extensive, and intensification has only proven destructive. Thus, growth in Mesopotamia has been from land-intensive, labor-extensive cultivation at isolated nucleus sites, to the expansive, land-extensive but labor-intensive system that culminated in the early Sumerian irrigation civilization. The ecological system in Mesopotamia requires nonintensive and flexible subsistence practices. Today, as in the past, extensive agriculture practiced by large, flexible, corporate groups continues to be the best form of adaptation to this region.

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