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Gisela von Wobeser y Ricardo Sánchez (editores)

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Woodrow Borah*

Inflation in Nueva Galicia, 1557-1598: Auctions of Tribute Maize

In 1958 the late Sherburne Cook and I published a study, *Price Trends of Some Basic Commodities in Central Mexico, 1531-1570.*[1] Covering forty years in the middle of the sixteenth century, the monograph was restricted to the territory of the Audiencia of Mexico, equally that of the royal treasury district also centered in Mexico City. Its purpose was to ascertain prices and price changes over time for the principal commodities delivered each year by Indican towns from the entire region to their Spanish overlords, i.e., the Crown and encomenderos. Behind that was the further purpose of calculating average annual prices for each tribute commodity in order to arrive at an approximate probable value in the minds of the Spanish officials who counted the population of an Indian town and recommended the annual tribute to be paid,[2] the necessary basis for analyzing what we dubbed the gamma category of demographic data, *tasaciones* without known relation of amount to tributary.[3]

Our study admittedly had ends, and used a regional mix of data, which distinguished it from price studies prepared in accordance with criteria accepted as proper by economists and historians studying price trends elsewhere. Although based on all the data we could then locate, it used fewer than we should have liked although they were well distributed and coherent. Within them were various kinds of price data, although all exhibiting in general the same tendencies, and data from various parts of the region. We did not calculate moving averages, as some critics pointed out, but came to that decision on the ground that our data covered the short span of forty years, too few for moving averages to be important and sufficiently few that surrendering years at either end to create moving averages represented a serious truncation. We lumped together wholesale and retail prices, on the ground that the trend should have been approximately the same in both and a line arrived at by least squares should be valid for both. The criticism, moreover, assumed a more rigid separation of wholesale and retail markets customary in Europe and in commecnrce today rather than the more flexible usage of sixteenth-century Mexico. Further, our resort to prices set at auctions of tribute, and to the commutations which were based on an average of preceding transactions at such auctions for the town in question, gave rise to the charge that these were not free market values and therefore suspect.[4] This point, one of the more serious of those made in criticism of our study, I shall deal with in this essay. All reviewers and critics, it should be pointed out, basically accepted or did not challenge our overall findings of a steep upward trend in prices, but wished for more conventionally acceptable data and refined calculations.

*University of California, Berkeley.

[1](Ibero-Americana: 40, Berkeley, 1958.)

[2]See the discussion in ibid., pp. 1-13.

[3]Sherburne F. Cook and Woodrow Borah, *The Indian Population of Central Mexico, 1531-1610* (Ibero-Americana: 44, Berkeley, 1960).

[4]The most extended duscission and criticism is in Enrique Florescano, *Precios del maíz y crisis agrícolas en México (1708-1810)* (Mexico City, 1969), pp. 8-28, which undoubtedly reflects a distillation of French comment. The most recent discussion, embodying French and Mexican views, is Pedro Pérez Herrero, "Comercio y precios en la Nueva España. Presupuestos teóricos y materiales para una discusión", *Revista de Indias*, 46 (1984), pp. 465-488, esp. pp. 475-476.

Since 1958 a number of studies of prices of foodstuffs in colonial Mexico have been published, although we still lack the fuller kinds of examinations which have appeared for Europe. Almost all concentrate upon the eighteenth century; a few cover as well the last years of the seventeenth. The sixteenth century and the earlier seventeenth remain as ill-covered as they had been before.[5]

This dearth of studies may be due, at least in part, less to lack of materials than to difficulties of access and expense of analysis. My own experience illustrates the point. During a year spent in Seville at the Archivo General de Indias, I took notes bearing directly on prices in the Audiencia of Nueva Galicia in the second half of the sixteenth century. Although my notes were made in the spring of 1959 and Sherburne Cook and I used them in our studies of Indian population,[6] only now am I able to analyze them for trends in price. The reason is simple: the detail was too great for treatment save at costs for beyond normal university research allocations in the humanities, or even most social sciences, until the advent of silicon chip computers radically lowered costs.

I present here preliminary findings for prices obtained in sales at public auction of tribute maize for royal towns in Nueva Galicia in the years 1557-1598. The data consist almost entirely of the successful bids at the annual auctions for each Indian town *en cabeza real*; that is, held to payment to the Crown. Since there were virtually no commutations to payment in money in the Audiencia of Nueva Galicia during these years, the values, with fewer than a half dozen exceptions, represent sale prices.[7]

I have described already the system of Indian tributes in the Audiencia of Nueva Galicia in a paper published in 1970.[8] Until the region became a separate judicial and administrative jurisdiction in 1548, it formed part of the Audiencia of Mexico, sharing as well in the same common administration and organization of Indian tributes, although Crown revenues were collected and disbursed by the royal treasury officials of the Caja de Zacatecas rather than those of the Caja de Mexico. In the first years of the new audiencia, the seat of the royal treasury officials became Guadalajara, under the name of Caja de Guadalajara, with a *subcaja* in Zacatecas because of its importance as a mining center. The years from 1550 to 1570 were a period of great change in the definition and levy of Indian tributes in the Audiencia of Mexico. In the Audiencia of Guadalajara –less populous, poorer, and far less developed economically– the changes in definition of tributary, the elimination of exemptions, and the reduction of tribute to a relatively uniform quota proceeded far more slowly. In 1557 some Indian towns still were providing *servicio* and were held to the yield of sowings set by area or by the amount of seed to be planted, but the high court already was implementing the requirements of the New Laws and subsequent royal legislation which eliminated servicio and set tribute in kind in definite amounts in accordance with a quota per tributary.[9]

In both the older forms of stating tribute and the newer ones, the system of collection did not change, and indeed remained approximately uniform during the forty-one years of

[5]The most important are *Ibid.*; Charles Gibson, *The Aztecs under Spanish Rule: A History of the Indians of the Valley of Mexico, 1519-1810* (Stanford, 1964), pp. 452-459 *et passim*; Claude Morin, *Michoacán en la Nueva España del siglo XVIII. Crecimiento y desigualdad en una economía colonial* (Mexico City, 1979); and Eric Van Young, *Hacienda and Market in Eighteenth-Century Mexico: The Rural Economy of the Guadalajara Region, 1675-1820* (Berkeley, 1981). A good deal of information on specific localities appears in town studies. See, for example, Cecilia Rabell Romero, *Los diezmos en San Luis de la Paz. Economía de una región del Bajío en el siglo XVIII* (Mexico City, 1984). The most recent study, Richard L. Garner, "Price Trends in Eighteenth-Century Mexico", *Hispanic American Historical Review*, 65 (1985), pp. 279-325, knits together data from previous studies for a continuous series on the whole colonial period, but data for the sixteenth and most of the seventeenth centuries are thin.

[6]Most notably in our chapter,"The Population of West-Central Mexico (Nueva Galicia and Adjacent New Spain), 1548-1960", in Sherburne F. Cook and Woodrow Borah, *Essays in Population History: Mexico and the Caribbean*, 3 vols. (Berkeley, 1970-1979), vol. 1, pp. 300-375.

[7]The records are found in Archivo General de Indias, Sevilla, Contaduría, legs. 856-861B.

[8]"Los tributos y su recaudación en la Audiencia de la Nueva Galicia durante el siglo XVI", in Bernardo García Martínez, ed., *Historia y sociedad en el mundo de habla española. Homenaje a José Miranda* (Mexico City, 1970), pp. 27-47.

[9]*Ibid.*

our period.[10] At the end of the annual harvests, which came in the months from September to October since the region is one of summer rainfall and dry winters, the royal treasury officials would have proclaimed the auction of the tributes in kind due the Crown from Indian towns, in the Spanish settlements within whose economic orbit the towns lay: Guadalajara, Zacatecas, Tepic, Compostela, and Purificación. After repeated proclamations by the public crier on major feast days and the lapse of a suitable interval, the royal officials proceeded to hold the auctions of the tribute of each Indian town assigned to that settlement, commodity by commodity. Since the presence of the royal officials was deemed necessary, the auctions in the Spanish settlements followed each other *seriatim*. Accordingly, the sale of tributes in kind required some months, usually from November to January, but sometimes starting earlier or finishing later. The sales, however, always dealt in the crop due from the immediately previous harvest unless the Indian town were in arrears on delivery or had petitioned for a deferral of payment.

For each Indian town held to tribute in a given commodity, then, there is at least one sale some time in the months after its harvest of the amount it had to deliver as tribute. If the amount was large, its might be auctioned in lots to several buyers and so constitute multiple sales. The successful bidder seldom paid in coin on the spot but more generally signed contracts promising payment in three installments during the subsequent year. These contracts were duly reviewed by the audiencia and copied by notaries for transmission to Spain where they underwent additional audit before they were filed. The successful bidder received the right to take delivery of his purchase in the Indian *cabecera* and so was responsible for transport beyond the center of the town. This feature of the system introduces an unknown element of cost of transport, present in the purchaser's mind and undoubtedly influencing his offer, but one that remained relatively constant from year to year since it did not change.

At this point we must ask whether the market sketched here was free or subject to rigging or manipulation. Such a question is never easy to answer since even in our time so-called free markets have been subject to manipulation. In the society of Nueva Galicia, with a population of a few thousand Spaniards in relatively few settlements and only a small number of them of consequence and affluence, opportunities for collusion and manipulation were undoubtedly present, particularly since the same people were involved in the bidding at each Spanish center over terms of years and in Guadalajara office-holders and officials of the cathedral chapter were among the most prominent bidders. Nevertheless, it seems clear that the market in tribute commodities in Nueva Galicia was fairly free. The royal treasury officials were required to, and did, encourage competitive bidding. Rather than sell when the bidding was thin, they postponed sale and returned to the public auction a few days later after further public proclamation. Their comments record instances of some bids after strenuous efforts to obtain more, and mention the premiums they occasionally had to offer for better prices. In yet other instances, again few, they record the number of bids as evidence of the need to accept a somewhat lower price than might be considered suitable. Upon review by the audiencia, an occasional bid was voided as too low and the tribute put to public auction again some months later. The distribution and movement of prices themselves argue a free market, since the variation within the year and from year to year is far too great for one rigged or otherwise controlled.

The records available to us for sales of tribute maize cover the harvest years from 1557 to 1598 with no data for 1579, 1588, and 1589, but with long runs preceding and following the gaps. They consist of the surviving accounts of the royal treasury officials of Nueva Galicia in the form of copies of their accounts, comments, and the contracts of sale. For each sale they record the date, the name of the Indian town whose tribute was being sold, the type and amount of the commodity being purchased, the price (usually as a unit price

[10] What follows is based on the reports and accounting of the royal treasury officials.

per fanega of maize but occasionally as a total value when the bid contained either a discount or a premium for the sale), and the name of the successful purchaser. In a number of instances, particularly when the tribute commodities of a town had fallen to such small amounts that they could not be sold individually, the entire tribute in kind for the town would be lumped together in a single transaction with an overall price, which makes it impossible to arrive at the value set on any item within it. Such transactions have been discarded from my calculations. The names of the purchasers form a valuable category of information, which through the application of much genealogical and family detail as well as knowledge of friendships, associations, and office holding would shed considerable light on the economic and social history of the period in Nueva Galicia and answer many questions about the nature of society there. Such research, however, lies beyond the purpose of this paper

The fact that the data record only one type of transaction, i.e., the sale of tribute commodities, and have no information on sale in any other kind of market, has both advantages and disadvantages for determining trends in prices of maize and any other commodity. The advantages are easily enumerated. First, for each town the sale of its tribute maize was held once a year, some time after the end of the harvest, when the prospective bidders already knew the abundance or scarcity of the crop and had some idea of the volume of supply and demand for whatever purpose for which they wanted the maize. The fact that in certain years the tribute of large towns was divided into portions for separate bidding did not change this feature. Second, transportation as a factor in determining price was held constant even though the maize was delivered to the successful bidder in the *cabecera* of the town so that he had to move it to where he wanted it, for the maize of the same town was put to auction each year, its price for the year forming a recurring item in a mix of various towns with recurring, though differing, costs of transportation. Third, the question of wholesale or retail transaction may be eliminated since the bidding was held to a uniform procedure. Undoubtedly, some of the bidders proposed, if successful, to resell the maize in some kind of a market since Spaniards in general did not raise maize at this time, yet had to feed servants in their households. Others of the bidders probably wanted a supply of maize for their workers on haciendas and in mines or other enterprises. Their needs to feed Indian mouths would have been greater and have accounted for more of the sales. In a few instances, the Spanish bidder served as agent for an Indian town which wished to buy the right to its tribute maize and so eliminate the need to deliver any.

The disadvantages of this kind of data are more complex. First is the fact that, although the sales refer to the end of the growing season for a specific harvest year, the dates for the sales of the tribute of each town vary from year to year across a number of months, from November March and ocasionally as late as May if the sale was disallowed and the maize had to be put up for auction again. Since the demand for maize and its price changed, beginning relatively low at the harvest and continuing low until late spring when it began to rise, reaching a maximum just before the harvest of the next year,[11] this variability perhaps affected the bids, although inspection of the dispersion displayed by the points of the graphs suggests that the basic factor in inducing variability was the abundance of the year's harvest and so overall supply.[12] Second, as the Indian population declined druring the course of the period and tribute assessments were revised in accordance with the lower number of tributaries in any given town, the quantities of tribute commodities entering the auctions, for our purposes specifically maize, shrank in accordance with the revision of the tribute schedules. The operation of this factor meant a gradual drop in the overall amount of maize involved in the annual auctions, but probably

[11]See Borah and Cook *Price Trends*, pp. 13-14.
[12]See the discussion for the alhóndiga of Mexico City in Florescano, p. 88 *et seq.*

meant as well keener bidding for the remaining supply. Third, as Indian towns in encomienda escheated to the Crown their tributes in kind entered the annual auctions, partially compensating for the shrinkage in the amounts furnished by the older royal towns but also adding an element of change since their tributes did not figure in the earlier royal auctions. We should, in fact, posit a smaller, parallel market in the tribute maize paid to encomenderos. Many undoubtedly consumed the maize in their households and enterprises, but others, who must have found themselves with more than they needed, would sell the surplus in some kind of transaction. As encomienda towns escheated to the Crown, the households of the heirs deprived of direct receipt of tribute maize, and other people who had relied on supply through this route, would have had to resort to maize passing through the royal auctions or some other form of market. The effect would be to drive up prices. Fortunately escheatment, although less randomly distributed in time since it tended to cluster in the last decades of the sixteenth century as encomiendas finished their third life, is much more randomly distributed in geography since the new royal towns were scattered throughout the area of southern Nueva Galicia, exactly the area of the older royal towns. Finally, I must mention the problem of locating many of the towns: those which have gone out of existence, those which have changed their names, often quite radically, and even worse those of the same name but different location. Luckily, the publication of Peter Gerhard's invaluable guide, *The North Frontier of New Spain*,[13] greatly eases solution of these difficulties. One may remark that the royal treasury officials, themselves perplexed by the need to distinguish among towns of the same name, often continued in subsequent years to give the identity of the last encomendero as an aid for themselves. It should be mentioned that some of the disadvantages noted could be and were solved by simple sweat (with occasional curses). For the changes in quantities there seemed to be no solution possible nor need for any. For the new towns entering the auctions, there was a possible solution in restricting calculations to the original towns, but since distribution appeared random, no adjustment was made.

Before I proceed to describe the procedure of entry of the data and analysis, a further question which may perhaps arise in the reader's mind remains to be answered: why the limitation to the years between 1557 and 1598? The reports of the royal treasury officials for Nueva Galicia cover years both earlier and later. However, for the years before 1557 tributes were assessed and collected under an earlier system inherited from the Audiencia of Mexico, in which tribute in agricultural commodities was set in terms of the yield of sowings either of a specified area or quantity of seed. Auctions under this system tended to sell the right to the crop without specifying the amount of it even though the local Spanish official must have determined it and reported his finding to the royal treasury officials. Further research in the treasury records may uncover the relevant data; I can only report that I found too few for use. The terminal year 1598 derives from the fact that with the tribute maize of 1599 the royal treasury began to implement an order from the Audiencia of Guadalajara, dated 2 February 1600, that the maize tributes of Indian towns in Nueva Galicia be sold to Spaniards deserving well of the republic at the average value of the prices received from the maize of each town in the previous five years.[14] Implementation of the order, which must have been issued upon petition of the more prominent Spaniards in the audiencia and with at least tacit consent of the viceroy, effectively ended the free play of price for tribute maize.

The procedure for arranging the data for entry into the computer was relatively simple, though lengthy, since over two thousand lines of data were involved. First, the data were entered upon sheets, one for each treasury province and year, from the notes taken in the Archivo General de Indias. From the sheets the data were transferred to a computer in a

[13](Princeton, 1982)
[14]Accounts of 1599, Archivo General de Indias, Sevilla, Contaduría, leg. 859B.

form of GANDER, a simple and unusually flexible program devised for the Data General computer by anthropologists at the University of California, Berkeley, for the recording and analysis of their own field data. For each sale there went into the computer the harvest year, treasury province, town, amount of maize sold expressed in fanegas and almudes, and the price per fanega accepted by the royal treasury officials, expressed in the silver pesos, reales, and granos of the common colonial Mexican coinage. Once all data were entered, a print-out was taken off, for checking against the sheets and, if desirable, the original notes. Any errors noted were corrected.

A trial analysis of the data in the computer disclosed that the division of the data by treasury provinces was essentially meaningless and that the more significant division should be by coast and plateau. Accordingly, the data were rearranged --an easy matter for the computer-- into two divisions according to altitude and climate. Only data for the treasury province of Zacatecas, although incorporated in the highland data, were reserved as well for additional and special treatment. The towns concerned, all in the Juchipila Valley to the southwest of the city of Zacatecas, supplied the new silver mines in their first years, but by the late 1560s the prices bid for the tribute maize showed a special and unusual pattern, to be discussed later.

For the purpose of anlysis all quantities had to be converted to the one unit of almudes and the prices into granos so that the computer would deal with single expressions in each instance. At this point a question arose as to the more representative value for determining trend in price. Basing calculation upon the total unit prices of each year would assign a perhaps excessive weight to the many little towns delivering small quantities. A weighted average derived by calculating the total amount of money and total quantity of maize involved for each major region for each year, and dividing the first by the second, would give due weight to the quantities involved and would allow the larger towns more influence. In the end, the decision was to calculate trends by both methods, but as a check to separate and calculate the trends for the indivual towns of Tlaquepaque and Tepic, both close to substantital Spanish settlements, and for Mezquituta in the Zacatecas province.

Trends were calculated by least squares through the program called REGRESS, and through the same program the corresponding graphs were sketched upon a data plotter. To one who has been used to the tedious methods of an earlier technoligy, the process is little short of miraculous. Nine graphs were drawn in less than half an hour. The graphs were then redrawn by a technician in order to reduce them to the size of typewriter paper. They are appended to this essay.

What do they show? Whether calculated in terms of unit price per fanega of maize at each sale or the weighted average price per fanega for the year, both coast and plateau exhibit a strong upward movement of values. Let us begin examination with the calculations in terms of unit price for the coast and the plateau, leaving all discussion of Zacatecas, including Mezquituta, for slightly later. With 1,234 items entering the calculation, the coast has the largest number of data, which also show the greatest amount of dispersion. Beginning in 1574, prices on the whole moved distinctly higher, a somewhat surprising development since it anticipated the great epidemic of the 1570s by at least one year. Nevertheless, calculation of the trend by subperiods 1557-1574 and 1575-1598 demonstrated that a single trend line for the entire period expresses the trend well. The slope of the line for the entire period is 1.1612. With a t value of 12.3 for 1232 degrees of freedom, the probability that these results are due to random variation in the data is far less than one percent.

Although I had separated data for the plateau from those for the coast in order to test for possible difference in degree of upward movement, the graph for unit prices for the plateau shows a slope of almost the same degree. For the plateau, calculation of a single trend line for the 762 items entering into the calculation yields a slope of 1.1650. The

difference with the coast is insignificant for the period of forty years. The value for t, 17.0, is even higher than that for the coast, and with 760 degrees of freedom again indicates a probability of far less than one percent that these results are due merely to random variation.

As a check upon the calculations in terms of unit prices, I have had the computer also calculate weighted average prices for each year, i.e., for both coast and for plateau there would be one value each for every year, representing an average reached by multiplying for each town the amount of maize sold at the auction by the unit price, summing the amounts of maize and of money involved in the transactions, and then dividing the sum of money by the sum of the maize to arrive at a weighted average price for the region for that year. The effect is to reduce variation markedly, entirely within the year and somewhat from year to year although there would still be the variation caused by differences in the abundance or scarcity of the year's crop. For the coast, with values for 37 years, the slope of the trend line is reduced somewhat to 1.4742, but still indicates a rise from approximately 0/3 (3 reales) to 1/0/1 (1 peso, 0 reales, 1 grano), that is to say, 2.8 times. With 35 degrees of freedom, t at a value of 4.7 remains well beyond the one percent level of probability that the result should be ascribed to random variation. (These are values taken from the trend line, the slope of which is influenced by high values in the 1570s and 1580s. The actual values at either terminus of the trend line are lower: for 1557-1559 an average of slightly less than 0/2/5, and for 1596-1598 en average of approximately 0/6/4, for an increase of two and a half-fold.)

For the plateau, corresponding calculations result in a trend line with a slope that is still markedly upward (1.3160) but, as for the coast, somewhat less so than that for unit prices. The rise was approximately from 0/3/6 to 1/0/6. Calculated in terms of weighted annual average prices, tribute maize sold at auctions for the plateau towns brought higher prices relative to the coastal towns in the earlier years and less in the later ones. For the 41 years of the period, the rise for the plateau was 2.4 times. With 39 annual averages entering the calculation, a value of 6.2 for t, with 37 degrees of freedom, again indicates a reliability of the calculation considerably beyond the one percent level. (Again, these are calculations from the trend line. The actual values at either terminus are somewhat different: for 1557-1559 0/2/11, and for 1596-1598 a value of 0/7/11, for an increase of 2.7 fold.)

Recalculating by weighted annual average prices thus confirms the general result obtained through examining unit prices, but somewhat reduces the steepness of slope of the trend lines. As a further check upon my calculations, I had the computer sort out the data for one town in each region, a town so close to the major Spanish settlement that transportation for Spanish use could be ignored. San Pedro Tlaquepaque lay within half a league of Guadalajara, or a half-hour's walk; Indian Tepic lay contiguous to the Spanish city at even less distance. For each town the unit price for the year was used for the calculation by least squares of trend for the period.

For Tepic, in the coastal region, the slope of the trend line (2.0115) is distinctly greater than that for the entire region in terms both of unit prices and weighted annual average prices. The rise for the period in the value of tribute maize secured from Tepic would be from approximately 0/4 to 1/3 on the trend line. With data for 38 years, t at 2.0 with 36 degrees of freedom is again a highly reliable calculation well beyond the one percent level of probability. For San Pedro Tlaquepaque, on the plateau, data for 40 years yield a trend line with a slope of 1.8693 and a value for t of 8.0, with 38 degrees of freedom well beyond the one percent level. As in the case of Tepic, the rise in prices during the period for the tribute maize of Tlaquepaque was steeper than the regional trend whether calculated in terms of unit prices or average weighted prices. The movement was from 0/3 to 1/2, or more than three-fold. The values for Tlaquepaque may represent a premium on maize in the audiencia seat and the largest Spanish settlement in the area, just as the premium on tribute maize from Tepic may represent a similar premium at the local capital.

These calculations for the two Indian towns both confirm that there was a sharp rise in the prices for maize, but in varying from other calculations they demonstrate that the regional figures on both bases represent mixtures of individual town values. Contrary to what one might have expected at the outset, the overall rise was approximately of the same degree of steepness on the coast as on the plateau. One might have expected a steeper rise in the former because of the more rapid decline of the Indian population in the lowlands, since that decrease meant correspondingly greater shrinkage in the amounts of tribute maize entering the auctions at the same time that Spanish need for maize to feed workers on haciendas, estancias, and other enterprises at the least was holding steady, but more probably rising. Given the technology of the day and the nature of settlement –dirt trails serving as roads, transportation by bearer and pack animal– it was not economical to move bulky commodities like maize more than a few days' journey, so that Nueva Galicia, both coast and plateau, really consisted at the time of many small market areas which had to take care of their own supply of foodstuffs. We can only speculate at this stage of investigation on how the growing deficit in maize on the coast was met: perhaps through the increasing availability of meat from the rapidly expanding numbers of livestock.

Let us turn now to Zacatecas. The data for Zacatecas have been included within the general calculations for the plateau, but have been segregated anew for another series of calculations because they exhibited a number of features which distinguish them from values for other towns both on the plateau and on the coast. In the earlier years the prices bid for maize in the Zacatecas area were in general higher than those for the tribute of towns elsewhere on the plateau; in the later years, to the extent that we have data, they were relatively low. The towns whose tribute maize was auctioned in Zacatecas in the early years are all in the Juchipila Valley, southwest of the mining center. Since the great silver strikes at Zacatecas were already under way in those years, clearly the maize was bid in for the maintenance of Indians working in the mines and in ancillary operations. In fact, one of the bidders in those years was Francisco de Ibarra, a discoverer of one of the deposits and a major mine owner. With the expansion of silver mining, especially after the development and application at midcentury of the mercury amalgamation treatment of ores in the patio process, the needs of Zacatecas for food for its workers surpassed the amounts that could be supplied from Indian tributes. Accordingly, the Spanish in Zacatecas very rapidly developed haciendas for raising the supplies they needed.[15] It is this development of a better and cheaper source of maize for the Indians at the mines which explains the apparently aberrant behavior of the prices bid for tribute maize in the middle and later years of our period. In 1570 Mezquituta, at the southern end of the Juchipila Valley, was removed from the bidding in Zacatecas to that in Guadalajara in recognition by the royal treasury officials of the possibilities of sale. It has been kept within the Zacatecas group for our purposes in order to permit comparison for the entire period. The maize tribute of the other towns in the Juchipila Valley was largely removed from auction in a slow, cumulative process and applied to the maintenance of the Indians who gathered salt from saline ponds for the royal monopoly, providing low-grade salt for the patio process. The only addition to the auctions in the later years was Apozol when it escheated to the Crown in 1595, but its maize too was auctioned in Guadalajara.

[15]Juan López de Velasco, *Geografía y descripción universal de las Indias*, 2d ed., ed. Marcos Jiménez de la Espada; prelim. Study, María del Carmen González Muñoz (Biblioteca de Autores Españoles, vol. 248; Madrid, 1971), pp. 137-138, for the descriptions of Jérez de la Frontera, Provincia de los Zacatecas, Llerena, and El Nombre de Dios. The Spanish towns raising irrigated maize and wheat for the mines are at considerable distances from the city of Zacatecas. Llerena, according to López de Velasco, is 25 leagues northwest and Nombre de Dios approximately twelve leagues beyond. However, most of the foodstuffs were moved to the mining camps rather than the city; these lay much nearer the Spanish towns. Haciendas growing the foodstuffs were, of course, outside the towns and might be nearer the mining camps or somewhat farther away. For the supply of the Zacatecas area roads were somewhat better and rude carts were used to a considerable extent; Philip Wayne Powell, *Soldiers, Indian, & Silver: The Northward Advance of New Spain, 1550-1600* (Berkeley, 1952), pp. 18-27.

The aberrant behavior of maize prices for Zacatecas, relative to that of all other towns both on the coast and the plateau, is clearly evident in the calculation of trend in terms of unit prices. The slope is downward (-.4157) on reports of 124 bids for the period. With a value for t of -2.1 on 122 degrees of freedom, the result does not have the extraordinarily high degree of validity of the previous calculations but still lies at between the two and three percent level of probability. The range of prices started at 0/6 but dropped to 0/4/6 in the course of the period. There is no reason to postulate that the removal of tribute maize from the auctions for the consumption of the salt workers lowered prices, inasmuch as the principal factor must have been the availability at lower prices of Spanish commercial supplies, grown nearer the mining area.

Calculation in terms of weighted average annual prices confirms the one based on unit prices. With data for 38 years, the variability is lowered so that the average price of maize begins at 0/5/6 and falls during the period to 0/5. The slope is mildly negative (-.1196); with 36 degrees of freedom, the value of t (-.36) falls so low that the calculation must be regarded as having only minor statistical reliability. In effect, the trend is flat.

An additional test in the form of calculating the trend of maize prices for Mezquituta bears out the determinations for the Zacatecas treasury province. Mezquituta tribute maize, it should be remembered, was auctioned in Zacatecas until 1570 and thereafter in Guadalajara. We have data for 36 years. The slope of the trend line is mildly upward (.4859), and t, with a value of 1.5 on 34 degrees of freedom, has a relatively weak validity since it indicates slightly better than a ten percent level of probability, i.e., ninety percent reliability, which is weak for historical data. The trend of prices would start at 0/4/4 and finish at 0/6/6.

The Zacatecas region, then, exhibits price behavior for tribute maize distinctly different from that of the rest of the Audiencia of Nueva Galicia. The contrast must be ascribed to development around the mining center of Spanish-owned haciendas raising maize. As its need for maize outgrew the possibilities of supply, it was more efficient to employ Indians directly on haciendas than to apply more indirect methods of extraction or production. The development testifies to the strongly entrepreneurial spirit of the Spaniards in the city, who obviously examined their problems and, in terms of the resources and technology available to them, moved to a rational solution.

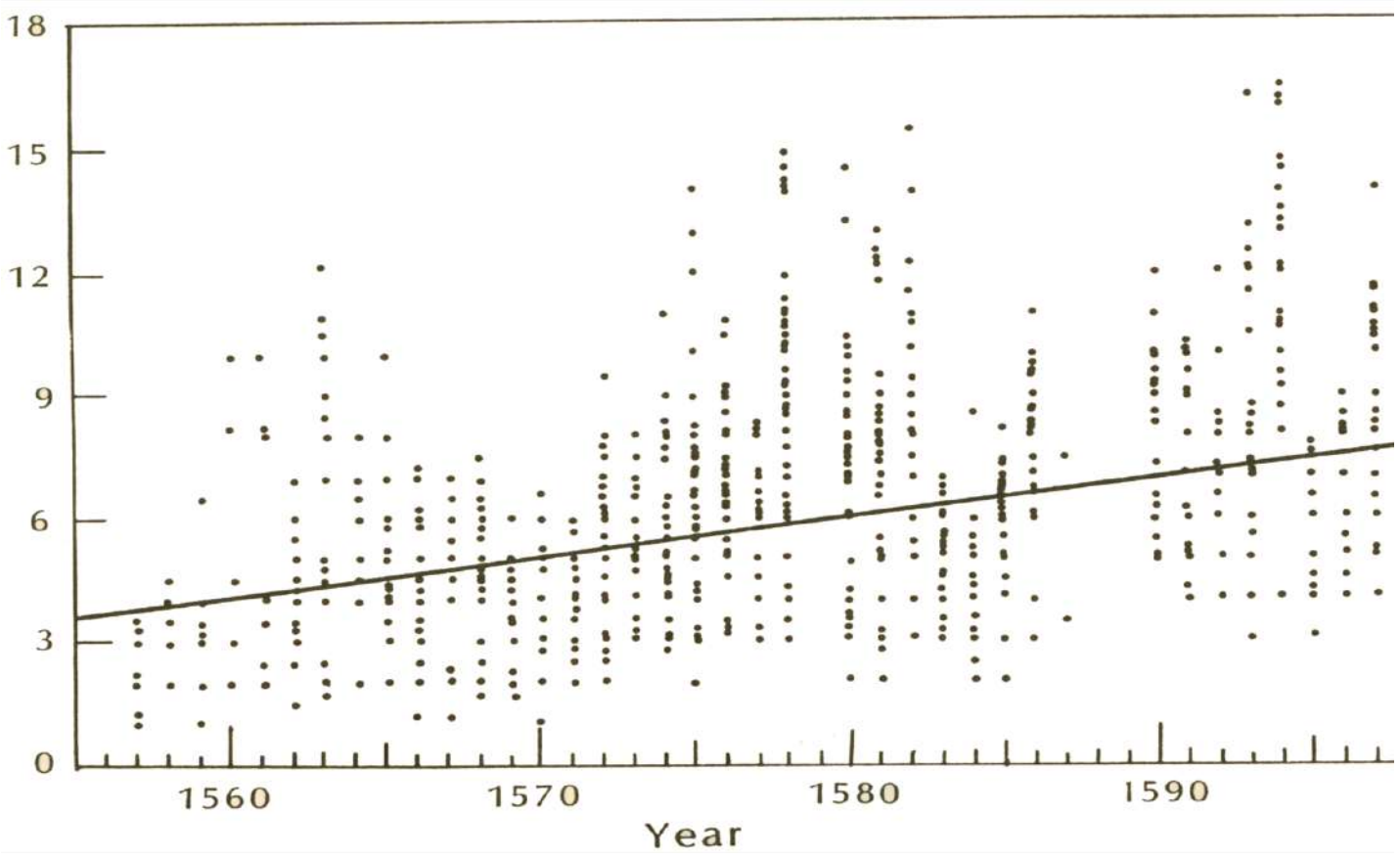
Taken as a whole, what does this body of data for prices of royal tribute maize in the Audiencia of Nueva Galicia indicate; what should be the interpretation of the calculations outlined in this paper? In the first place, clearly the bidding was relatively free. The variability in prices within each year and between years indicates a true market. In the second place, despite the exiguous numbers of Spaniards in some areas of the audiencia and the relatively small population of Guadalajara, Spanish society in Nueva Galicia tended to be capitalist, or, if one prefers the term, commercial-precapitalist. It was oriented toward enterprise even though much of its revenue may have come from administration and from encomiendas. Many of the bidders bought maize for workmen in mines and ancillary operations. Undoubtedly others, particularly those bidding in the tributes of the larger Indian towns, sought it for resale in smaller lots. Basically, they were acting as wholesalers acquiring a supply for the retail market. Lay and ecclesiastical officeholders, who figure prominently in the sales, may have fallen in any of these categories, their business activities being additional to their posts in the royal government or in the Church.

In the third place, the prices of tribute maize in the Audiencia of Nueva Galicia show a trend similar to that calculated for tribute maize in the Audiencia of Mexico. The results exhibited here are not fully comparable with those in the Borah-Cook study of 1958 in type or in temporal coverage. The latter covered the period 1531-1570, whereas data in this essay come from the years 1557-1598. Moreover, it made no division of coast and plateau, though this point may not be important since the division made in the

calculations presented here turns out to disclose nothing of significance. Whatever the differences in the two studies, some comparison can be made. The trends for both audiencias may have moved at different rates but clearly were upward. For the Audiencia of Mexico, the commutation values for maize set on the basis of average auction prices for a term of years immediately preceding rose from 0/4 for the audiencia as a whole in the 1560s to 0/9 (or 1/1) in 1627, when tribute in maize was commuted to silver coin for the entire territory. We have as yet no comparable data for the Audiencia of Nueva Galicia, but the calculations of trend for the coast and plateau to 1598 in terms both of unit prices and average weighted annual prices would indicate a slightly steeper upward tendency relative to the Audiencia of Mexico. How long the trend continued, we do not know. Extrapolating from 1598 into the seventeenth century for the Audiencia of Nueva Galicia would be highly speculative. We must await further studies for our enlightenment.

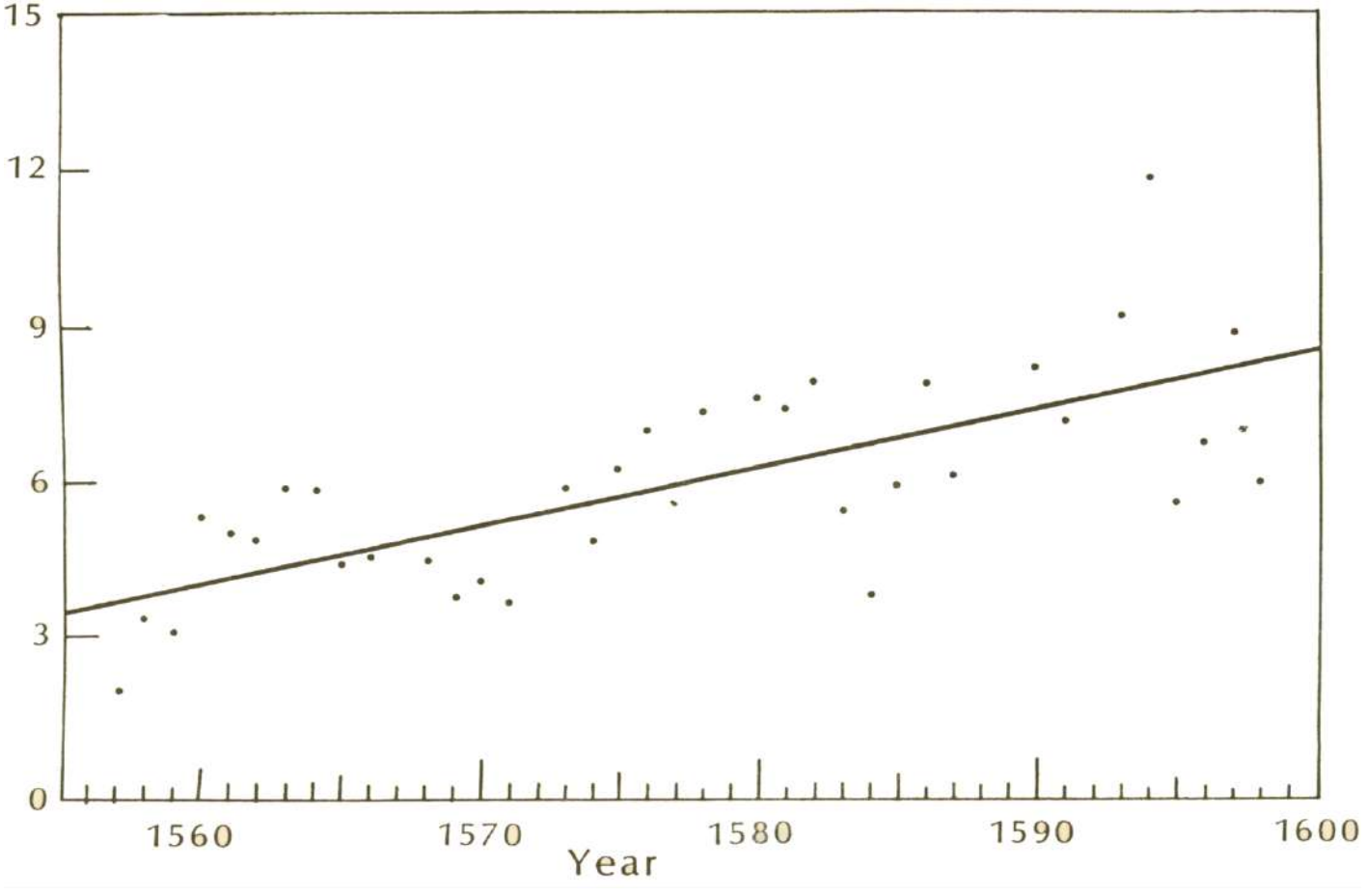
Maize Unit Prices — All Nueva Galicia

Reales / fanega



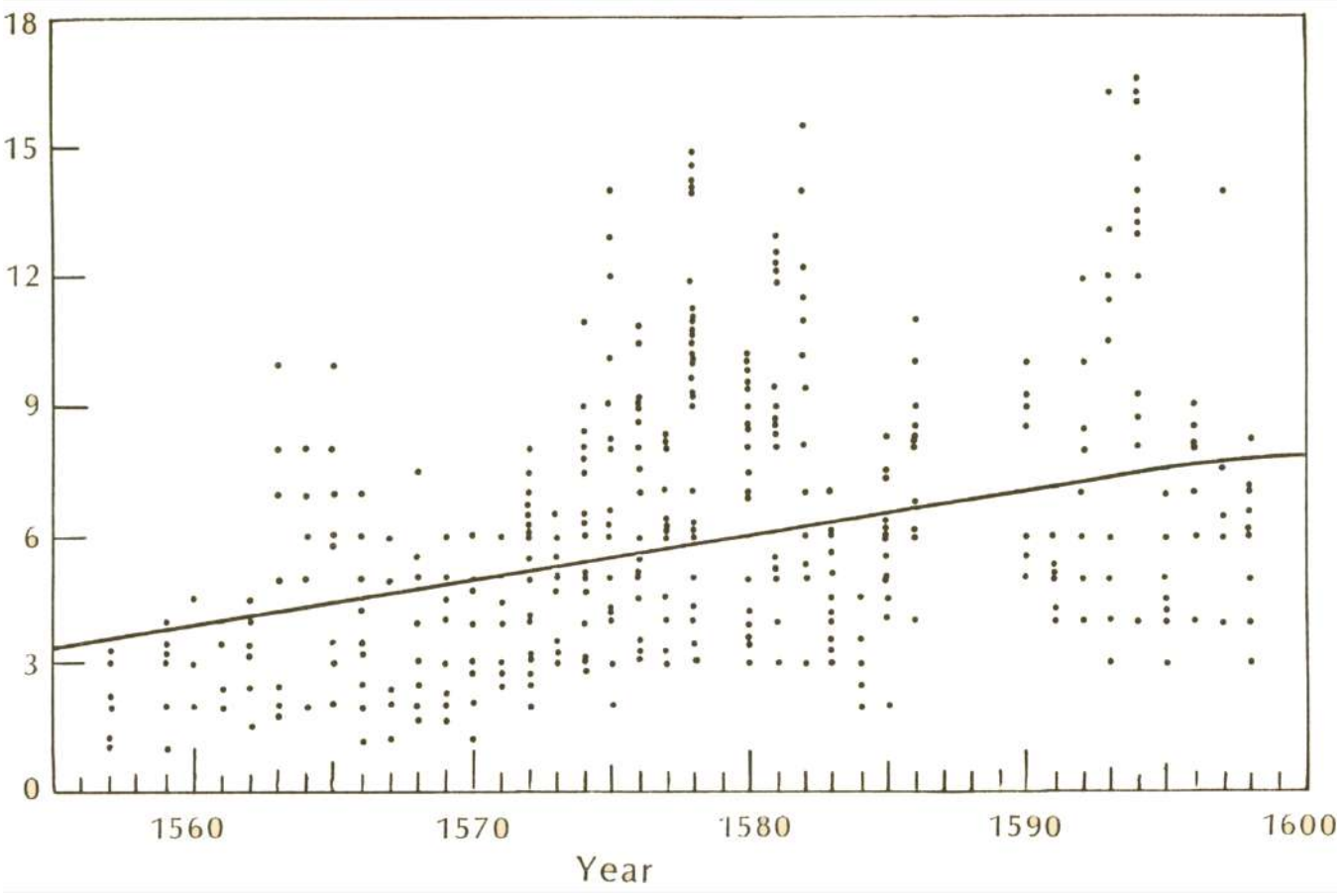
Maize Average Annual Prices – All Nueva Galicia

Reales / fanega



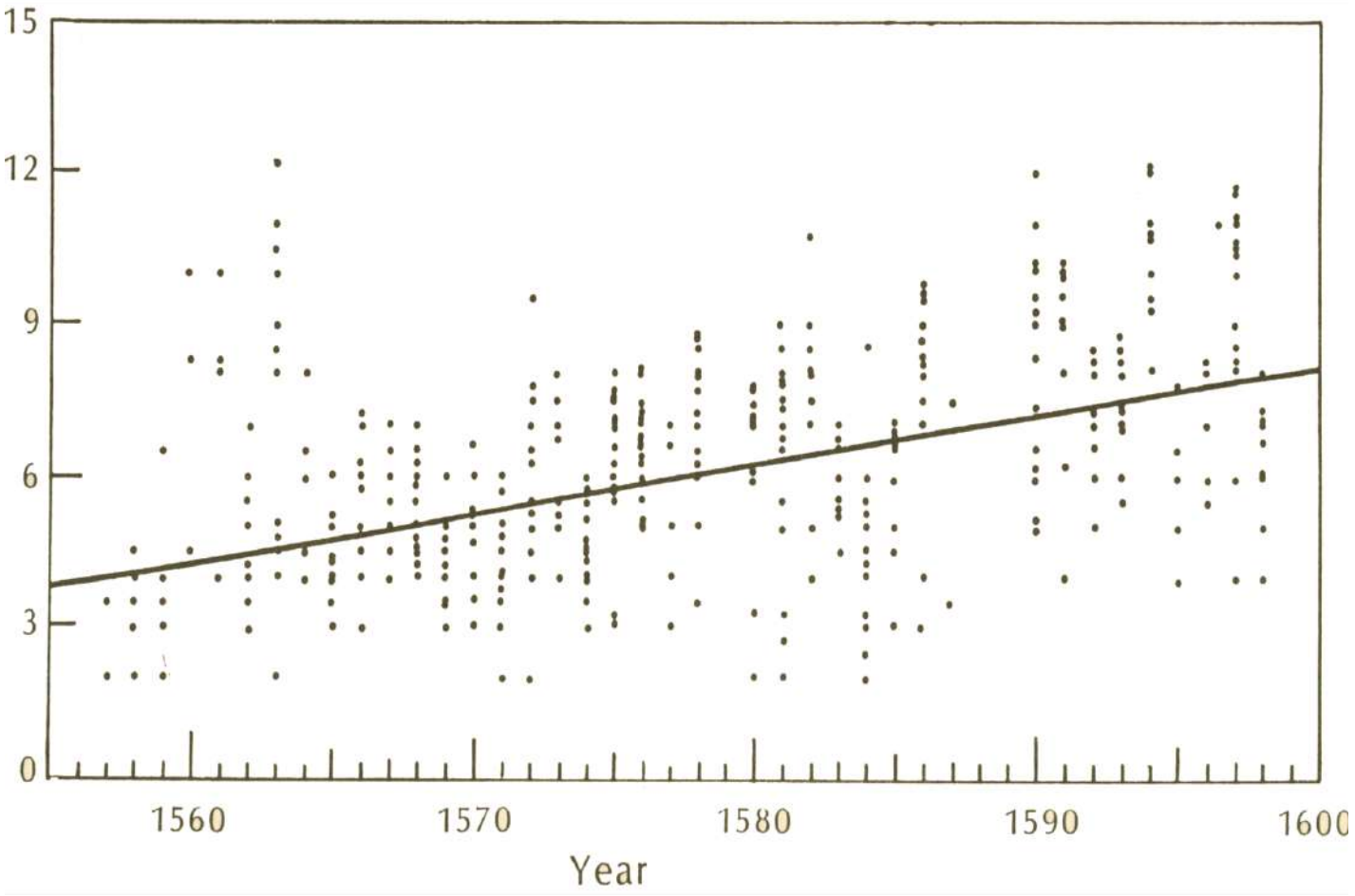
Maize Unit Prices—Coast

Reales / fanega



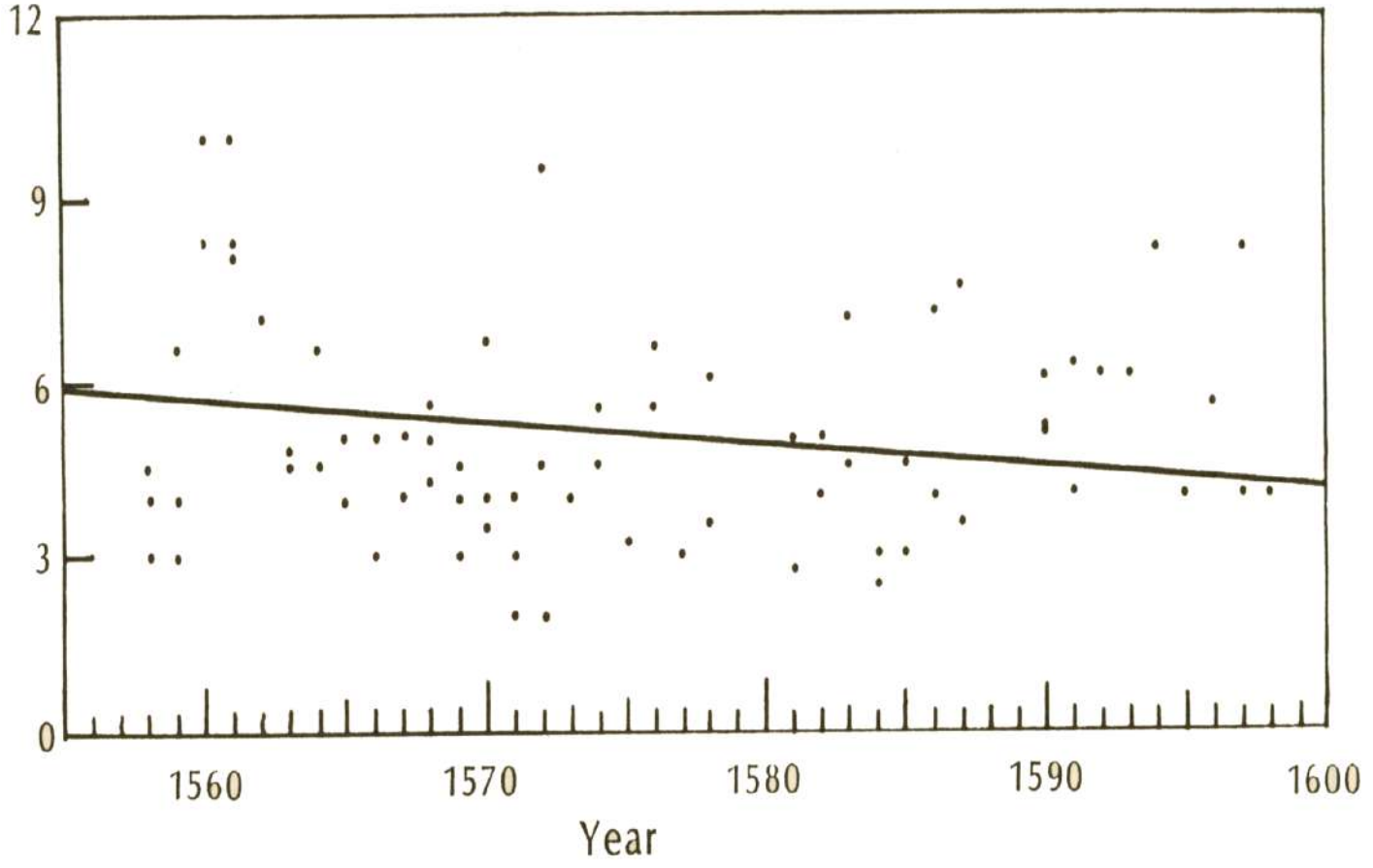
Maize Unit Prices — Plateau

Reales / fanega



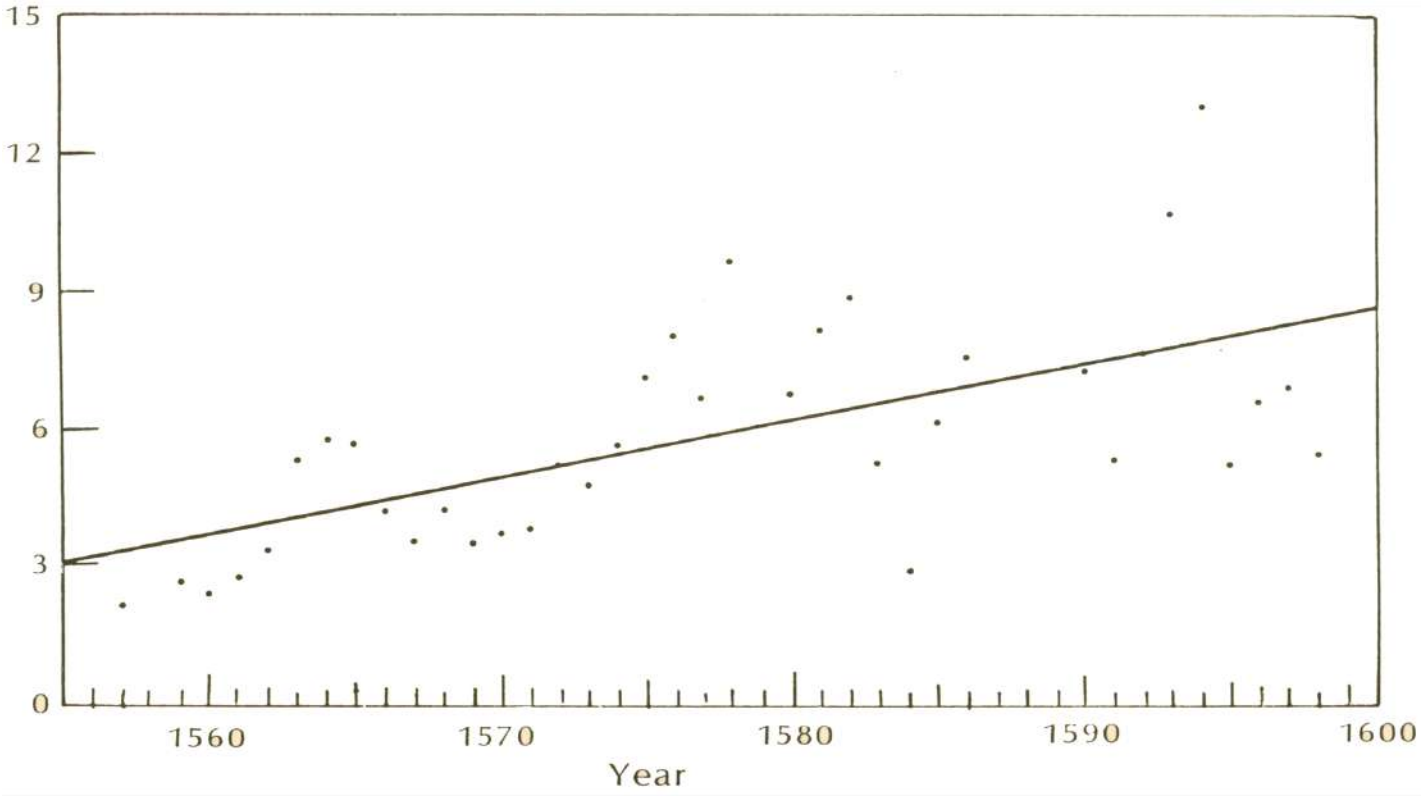
Maize Unit Prices—Zacatecas

Reales / fanega



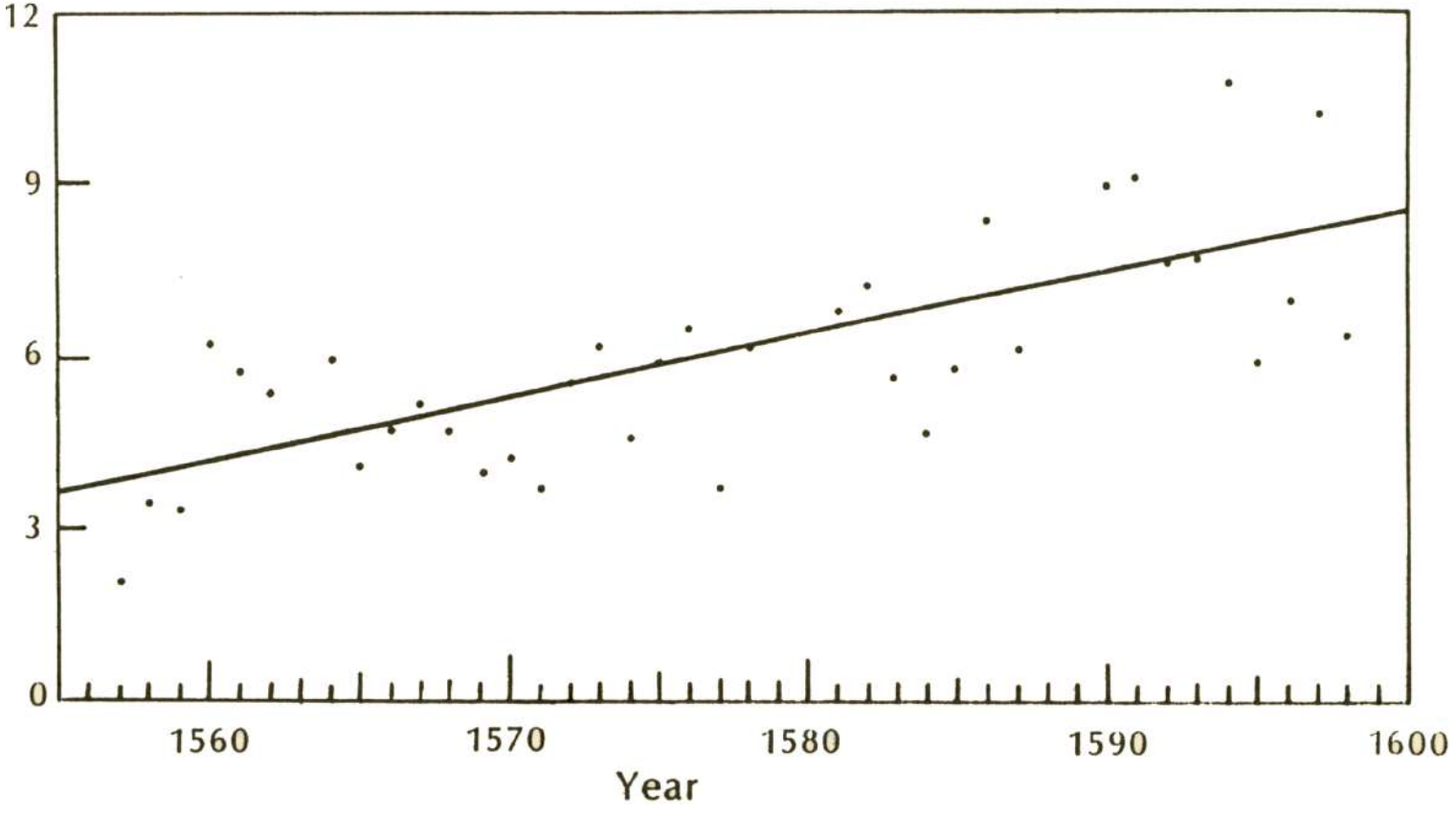
Maize Annual average Prices – Coast

Reales / fanega



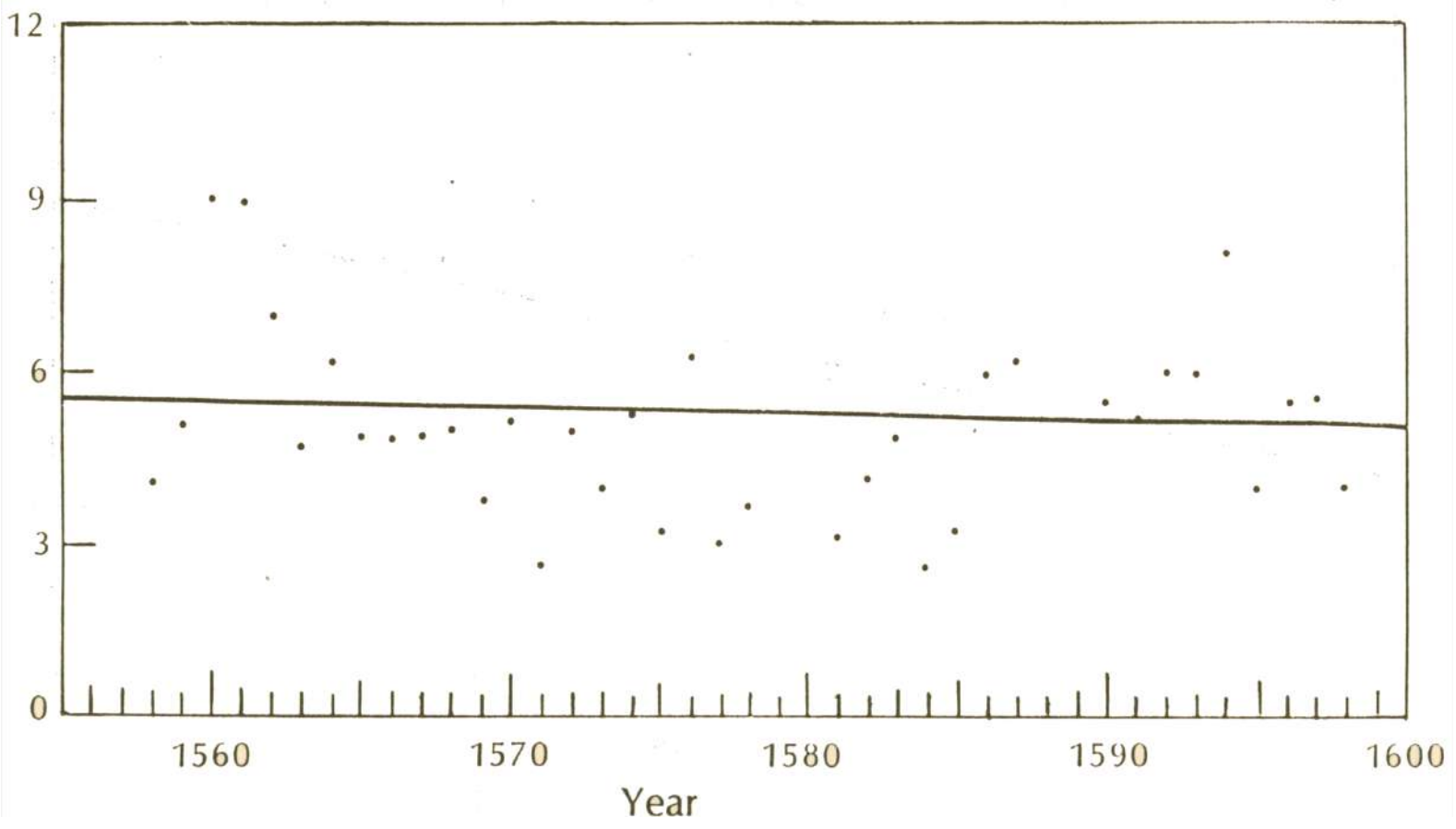
Maize Annual Average Prices—Plateau

Reales / fanega



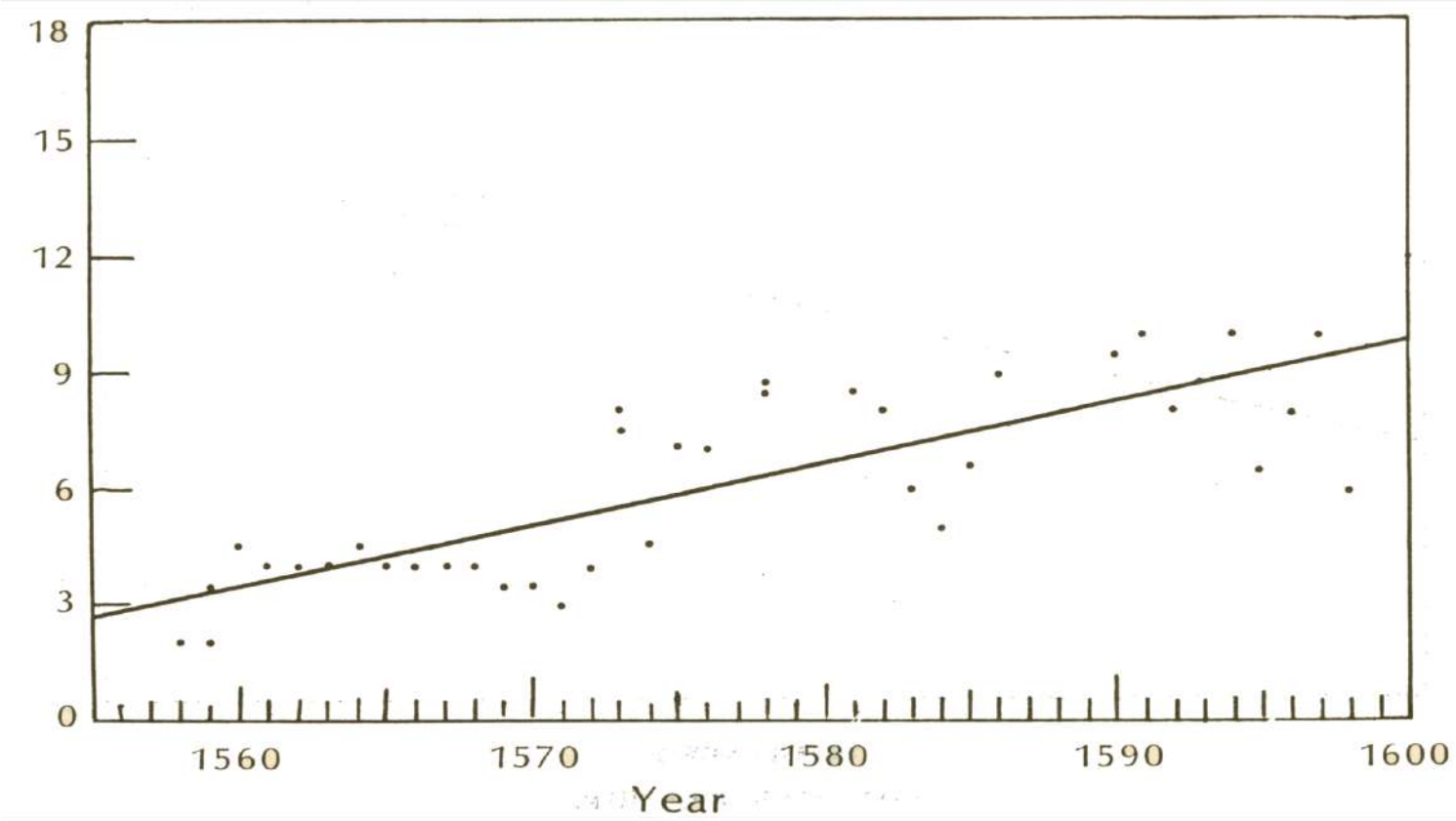
Maize Annual Average Prices — Zacatecas

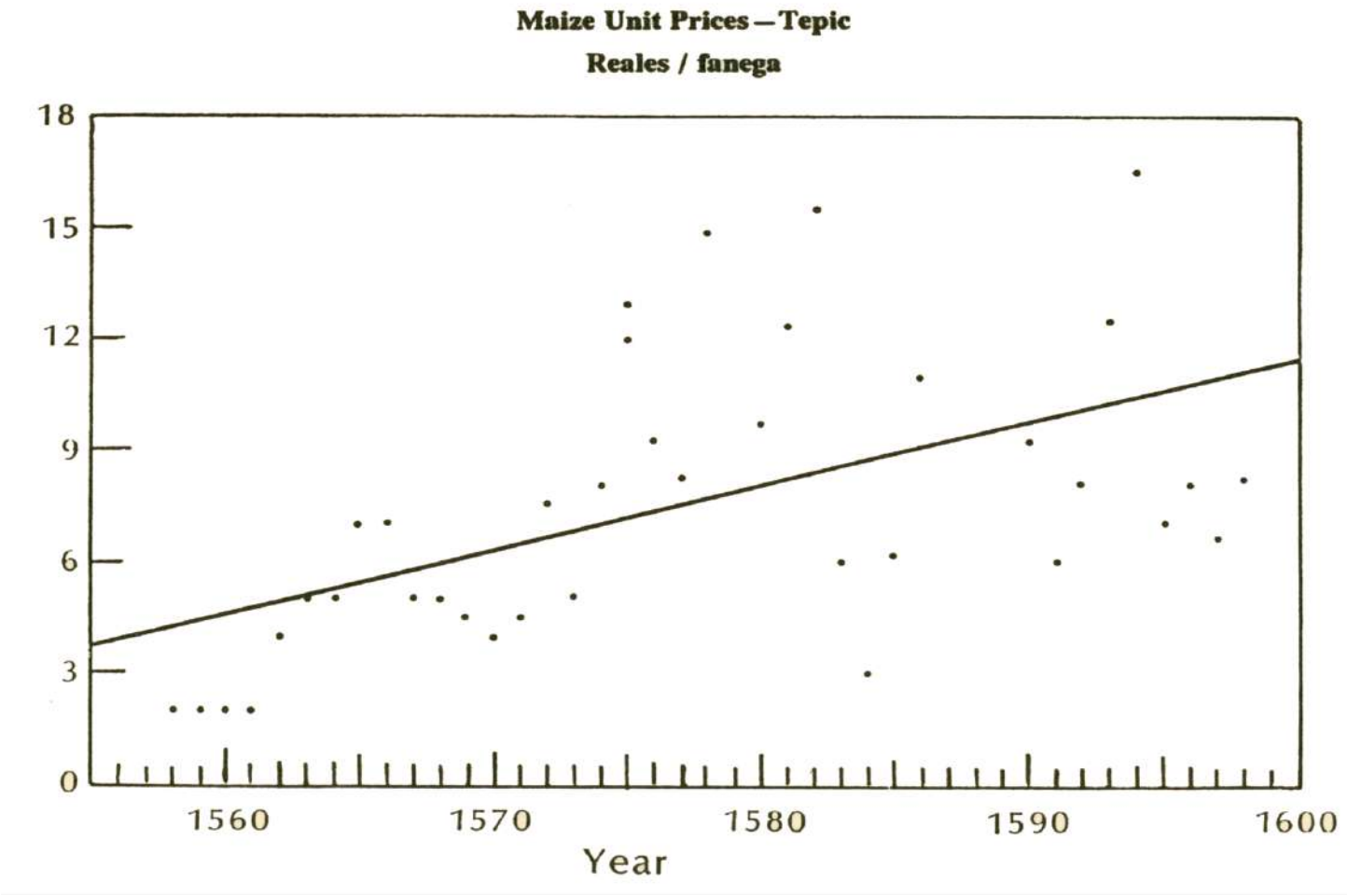
Reales / fanega



Maize Unit Prices — Tlaquepaque

Reales / fanega





Maize Unit Prices – Mezquituta

Reales / fanega