

A STUDY OF THE JOWAR MARKET
WITH SPECIAL REFERENCE TO PRICE BEHAVIOUR

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NATA DUVVURY

CENTRE FOR DEVELOPMENT STUDIES
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CHAPTER I

INTRODUCTION

Fluctuations in agricultural incomes have a direct impact on an economy's ability to sustain a steady growth rate. These fluctuations in income are essentially determined by two factors: (1) the quantum of production and (2) the prices of agricultural commodities. Analyses of the factors responsible for raising production so as to encourage an increase in production with minimum yearly fluctuations have been well detailed in the literature.^{1/} On the other hand, the determinants of prices of agricultural commodities have received only a cursory treatment. Furthermore, the existing studies on the determinants of prices relate mainly to rice and wheat and certain commercial crops.^{2/}

It is in this context that coarse cereals^{3/} have been neglected.^{4/} The importance of inferior cereals lies in three factors:

^{1/} See for example, A.Vaidyanathan "Indian Economy: Performance and Prospects", Economic and Political Weekly, Vol.XII, August 1977.

^{2/} See R. Thamarajakshi "Cereal Prices in India", Agricultural Situation in India, Vol. 26, Aug.1971;
N. Krishnaji, "Wheat Price Movements: An Analysis", Economic and Political Weekly, Vol. VIII, June 30, 1973; and
P.C.Joshi "The Sugar Cycle: A Diagnosis", Sankhya, Ser. B. Vol.35, 1973.

^{3/} Coarse cereals are also inferior cereals in the economic sense of the latter term; in this paper coarse cereals shall be referred to as inferior cereals.

^{4/} Uma Lele's work on jowar prices has been essentially to prove that various wholesale markets are integrated; she does not examine the determinants of the price of jowar. See for example, Uma Lele, "Market Integration: A Study of Sorghum Prices in Western India", Journal of Farm Economics, Vol.49, February 1967.

1. These are the cereals which are generally grown in dry areas and hence production of these grains is subject to wide fluctuations. Unless compensatory movements in prices take place this may induce large fluctuations in the incomes of farmers who grow these cereals. To understand the extent of the fluctuations in income one must determine how prices are related to output.
2. These cereals are region specific and in fact are cultivated in those very areas which are identified as pockets of poverty. A full understanding of inferior cereals in terms of production possibilities and price determinants would enable one to assess better the potentialities of these backward regions.
3. These cereals are in actuality basic wage goods in the agricultural sector in many regions of India. Therefore, the levels of consumption of the rural proletariat (small peasants and agricultural labourers)^{5/} are crucially dependent on the prices of these cereals.

In this study we shall examine the fluctuations in the price of jowar. The justification for focusing on jowar is that at the all-India level it is the most important crop, in terms of physical output, after rice and wheat. Moreover,

^{5/} Based on Utsa Patnaik's labour-exploitation criteria we have included small peasants in the category of rural proletariat for they, on the whole, hire themselves out more than use family labour or hire in labour. See Utsa Patnaik, "Class Differentiation within the Peasantry: An Approach to Analysis of Indian Agriculture", Economic and Political Weekly, Vol. XI, September 25, 1976, pp.A-82-A-101.

the share of jowar in the total production of coarse cereals is 66 per cent.^{6/}

Some of the previous studies on prices of agricultural commodities have been based exclusively on market factors such as excess demand, money supply and prices of other commodities.^{7/} In contrast, some other studies such as those by Krishnaji and Patnaik do not deny the relevance of such factors but emphasize the role of hoarding and state intervention (via procurement and other price policies).^{8/} Patnaik says, furthermore, that the behaviour of the prices of rice and wheat are to a certain extent the result of uneven development in the agricultural sector -- crop-wise, region-wise and class-wise.

In this study, we shall attempt to show that the usual demand-supply factors do not adequately explain the variation in price. We shall in the sequel examine the hypothesis that in an environment of rising price expectations, there is a tendency to perverse behaviour which is manifested in a positive correlation between output and prices; we shall argue that the latter is a consequence of increases in demand for stocks in periods of rising prices. In Chapter II, we shall fully examine the question whether jowar is a commercial crop destined for the market, or a subsistence crop, meant only for home consumption.

^{6/} N.S.Jodha, "Prospects for Coarse Cereals: Permanent Constraints of Jowar and Bajra", Economic and Political Weekly, December 29, 1973, p.145.

^{7/} See R. Thamarajakshi, "Determinants of Rice Prices", Agricultural Situation in India, 1970.

^{8/} N. Krishnaji, "State Intervention and Foodgrain Prices", Social Scientist, Vol.3, January/February 1975, and Prabhat Patnaik, "Current Inflation in India", Social Scientist, January/February, 1975.

After establishing the nature of jowar from this point of view, we shall turn to an examination of the nature of fluctuations in the price of jowar. The major emphasis of Chapter III will be on the seasonal fluctuations in the price of jowar; we shall examine there the relevance of such factors as procurement policy, pattern of market arrivals and hoarding. The temporal rise in the price of jowar and the underlying explanatory variables will be the focus of Chapter IV. In Chapter V, we shall state our tentative conclusions.

CHAPTER II

COMMERCIAL NATURE OF JOWAR

Jowar is usually referred to as an inferior cereal. Implicit in this statement are a set of assumptions concerning the production and consumption of jowar. Concerning consumption, it is commonly assumed that this cereal (as well as other coarse cereals) forms a significant proportion of the consumption basket of the rural poor (i.e, the rural proletariat). Also it is held that as income rises, the consumption of jowar declines and the consumption of superior cereals (rice and wheat) increases. Both these assumptions together imply a skewed distribution for the consumption of jowar in favour of the rural poor. On the production side, the assumption is that jowar is mostly grown on small farms, even in dry areas. This set of assumptions underlie statements^{such}/as:

"Jowar is a coarse cereal and an important subsistence crop consumed very largely by the low income farm families which produce it ..."1/. The logical implication of this statement is that there is a very limited rural/urban market for jowar.

Such a conclusion can be challenged by referring to the data on production and consumption of jowar. The focus of

1/ L.S.Venkataraman and M.Prahladachar "Study of Cropping Pattern Changes in Andhra Pradesh During 1950-1975", ICSSR Discussion Paper, Institute for Social and Economic Change, Bangalore (Unpublished), p.37.

this chapter will be to establish the commercial nature of jowar, by referring to data relating to consumption, production and disposal of produce. We also examine the interrelationships between prices in different wholesale markets to assess the extent of integration of these markets. We shall establish that though jowar has a lower price than rice and wheat, it is not different from these cereals from a market — and hence social — point of view.

Jowar is a dry land cereal, mostly grown on rain-fed lands. Nearly 34 per cent of the total area under jowar is in Maharashtra. Next come Andhra Pradesh, Karnataka and Madhya Pradesh, with 14.9, 13.2 and 12.5 per cent of the total area respectively. The fifth largest producer, viz., Tamil Nadu, accounts for 4.3 per cent of the area. Our analysis will be limited to four States, Andhra Pradesh, Karnataka, Madhya Pradesh and Tamil Nadu.^{2/}

1. Consumption

An examination of the National Sample Survey (NSS) data with respect to the consumption of jowar yields some unexpected results. As can be seen from Table II:1, the proportion of jowar in the total cereals consumed does decline with a rise in expenditure.

^{2/} The exclusion of Maharashtra is primarily because of non-availability of price data.

TABLE II:1

JOWAR CONSUMED BY EXPENDITURE CLASSES:
QUANTITIES AND PROPORTION IN TOTAL CEREALS

Expenditure Class (Rs. per month per capita)	1961-62		1973-74	
	Quantity of jowar (kg.)	Proportion in total cereals	Quantity of jowar (kg.)	Proportion in total cereals
0 - 13	1.98	16.12	1.14	24.52
13 - 15	2.18	14.05	1.24	20.81
15 - 18	1.83	11.57	1.05	13.76
18 - 21	1.52	8.53	1.48	16.55
21 - 24	2.02	10.32	1.76	17.62
24-28	1.75	8.88	1.89	16.70
28-34	2.26	10.65	1.84	14.64
34 - 43	2.32	10.32	1.83	13.08
43 - 55	1.92	7.72	1.65	10.67
55 - 75	1.03	3.91	1.42	8.31
75 - 100)			1.33	6.87
100 - 150 (1.64	4.08	1.28	6.23
150 - 200)			1.75	8.10
200 & above			1.41	5.40

Source: Calculated from NSS, 17th Round, Report 200,
"Tables with Notes on Consumption 1961-62, Part II"
Calcutta, 1969 and NSS, 28th Round, Report 274,
"Tables with Notes on Consumption", Ministry of
Planning, Government of India, September, 1976.

The decline is in fact more sharp in respect of States where jowar is largely consumed. But this decline in proportion consumed has not yielded a skewed distribution in the consumption of jowar in favour of the rural poor. On the contrary, we observe that the share in consumption of jowar for each decile is approximately equal in both rounds of NSS (see Table II:2).

TABLE II:2

DECILE SHARES OF CONSUMPTION OF
JOWAR, ALL INDIA, RURAL: 1961-62
AND 1973-74

(Percentages)

Decile	Share of consumption	
	1961-62	1973-74
Bottom 10	9.05	9.90
bottom 20	19.64	21.36
bottom 30	31.64	32.69
bottom 40	42.21	43.99
bottom 50	51.66	54.73
bottom 60	59.71	60.05
bottom 70	69.27	74.49
bottom 80	79.61	83.32
bottom 90	90.22	91.71

Source: Calculated from NSS Reports, 200 and 274.

This pattern is also repeated in the four States. To state in technical jargon, we have found that the expenditure elasticity of jowar is nearly zero. However, since the consumption of cereals as a whole is extremely uneven, with higher levels associated with the better-off sections of the population, the lack of differences in the levels of consumption of jowar implies that in the jowar consuming States the inequality in cereal consumption arises wholly not out of extreme differences in the consumption of superior cereals. To what extent the observed lack of differences in the consumption of jowar as between different expenditure groups arises out of biases in the NSS estimates, is difficult to say, however, for want of reliable data. Nevertheless, even after making allowances for possible overestimation of jowar consumption by poor households and under-representation of rich households in the NSS samples, it appears safe to assume that jowar consumption is not wholly restricted to the very poor households. It can be seen from Table II:1 that even in the expenditure groups of over Rs.55 (per capita per month) the consumption of jowar has been estimated to be higher than 1 kg. per capita per month.

Aside from this phenomenon of near zero expenditure elasticity for jowar consumption, another important fact is the reliance of the poor people on the market, for their cereal needs.

Although conclusive evidence is not available, this dependence on the market can be observed if one examines the data in Table II:3.

TABLE II:3

MARKET DEPENDENCE OF RURAL HOUSEHOLDS
FOR FOODGRAINS REQUIREMENTS IN ANDHRA
PRADESH (1963-64)

(Percentage)

Size of holding (acres)	Market dependence ^a		
	Producer households	Agricultural labourer households with land	Agricultural labourer households without land
0.00-2.49	58.7	81.0	-
2.50-4.99	41.7	60.6	-
5.00-7.49	31.6	43.8	-
7.50-9.99	38.7	12.8	-
10.00- ^b 19.99	22.9	19.9	-
15.00 and above	15.5	14.1	-
All Classes	34.7	63.1	99.4

Note: a. Market dependence refers to foodgrains brought in the market as a proportion of total consumption.

Source: Agricultural Prices Commission, Report on Price Policy for Kharif Cereals for the 1968-69 Season (New Delhi, 1969), p.50.

In producer households the dependence on the market declines from 58.7 per cent to 15.5 per cent with an increase in the size of holding. The decline is from 81.0 per cent to 14.4 per cent in the case of agricultural labourer households.

The most important observation is that small peasants (households with holdings below 2.5 acres) are heavily dependent on the market for their consumption of foodgrains. This pattern has also been found in Maharashtra and Rajasthan.^{3/} This dependency on the market (for meeting foodgrain requirements) by the rural poor along with their significant share in the demand for jowar (and inferior cereals in general) together provide a basis to conclude that there is a significant rural market for jowar.

2. Production

On the production side, data collected for the year 1970-71 for the four States indicate that in at least three States the proportion of area devoted to jowar is more than 30 per cent on landholdings above 30 hectares. An obvious explanation for this phenomenon is that the percentage of dry land increases along with an increase in the size of farm. The interesting conclusion one can draw is that a significant proportion of the marketable surplus is concentrated on landholdings above 10 hectares. Figures on the contribution of each size holding to the total production

^{3/} See Agricultural Prices Commission, Report on Price Policy for Kharif Cereals, For the 1968-69 Season, p.50

of jowar, shown in Tables II:4 and II:5, provide additional support for this conclusion

TABLE II:4

PERCENTAGE DISTRIBUTION OF TOTAL AREA UNDER
JOWAR BY SIZE HOLDING 1954-55^a;
ZONES AND ALL INDIA

(Percentage)

Size of holding (hectares)	North	West	East	South	Central	N.W.	All India
Less than 1.0	4.44	.63	2.61	2.03	.21	.54	.83
1.0--2.0	26.86	4.43	18.30	13.30	3.76	6.34	6.77
2.0--4.0	30.88	10.39	28.11	22.20	11.70	11.82	14.46
4.0--10.0	27.91	30.01	43.87	30.78	30.54	39.60	31.20
10.0 and above	9.90	54.65	7.19	31.69	53.24	36.70	46.74
All Sizes	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: a) North - Uttar Pradesh;
West - Bombay, Saurashtra, Kutch;
East - Bihar, Orissa, W.Bengal, Assam, Manipur and Tripura;
South - Travancore-Cochin, Coorg, Andhra Pradesh, Tamil Nadu and Karnataka.
Central - Madhya Pradesh, Madhya Bharat, Hyderabad, Bhopal, Vindhya Pradesh;
N.West - Rajasthan, Punjab, PEPSU, Jammu Kashmir, Ajmer, Delhi, Himchal Pradesh.

Source: NSS 8th Round, Report No.70, Report on Land Holding, Rural Sector, Delhi, 1963, Tables 162-168.

TABLE II:5

PERCENTAGE DISTRIBUTION OF TOTAL AREA UNDER JOWAR
BY SIZE HOLDING 1970-71: STATES AND ALL-INDIA

Size of Landhold- ing (ha.)	(Percentage)				
	Andhra Pradesh	Karna- taka	Madhya Pradesh	Tamil Nadu	All- India
Less than 1.0	4.0	2.4	2.0	15.6	4.08
1.0 - 2.0	9.3	7.8	5.5	21.3	8.26
2.0 - 4.0	19.7	17.1	14.8	26.4	18.32
4.0 - 10.0	34.6	35.7	38.2	26.1	35.57
10.0 and above	32.4	37.0	39.5	10.6	34.58
All holdings	100.00	100.00	100.00	100.00	100.00

Source: All-India Report on Agricultural Census,
1970-71.

At the all-India level in 1970-71, operational holdings of 4 hectares and above accounted for 70 per cent of area under jowar, out of which holdings of 10 hectares and above accounted for 34.6 per cent. A similar pattern can be observed in all the States except Tamil Nadu where approximately 63 per cent of area under jowar is accounted for by size holdings below 4 hectares. As between the two time periods, the share of the large farmers in the area under jowar has declined from 46.79 per cent in 1954-55 to 34.58 per cent in 1970-71. Despite this decline, the crucial point to note is that jowar still continues to be cultivated by large farmers to a significant extent.

3. Disposal of Produce

This tentative conclusion as to the concentration of marketable surplus in large holdings is further corroborated by figures on the percentage of households disposing of surplus in 1966-67 as presented in Table II:6.

TABLE II:6

PERCENTAGE OF HOUSEHOLDS DISPOSING^a OF THEIR OWN PRODUCE IN RESPECT OF JOWAR TO TOTAL NUMBER OF HOUSEHOLDS REPORTING THAT CROP, FOR EACH SIZE CLASS OF TOTAL LAND OPERATED, JULY 1966 - JUNE 1967, ALL INDIA.

(Percentage)

Size Class (acres)	Harvest Season		
	Autumn	Winter	Spring
Upto 0.99	-	4.89	39.50
1.00-2.49	-	3.68	12.63
2.50-4.99	9.00	13.60	26.62
5.00-9.99	6.34	11.54	29.49
10.00-14.99	13.37	12.15	46.86
15 and above	11.96	25.54	44.28
All Classes	9.52	14.14	35.92

Note: a) Disposal of produce in this case specifically refers to sale of produce.

Source: NSS, 22nd Round, Report No. 202, Tables with Notes on Farm Practices, 1975, p.10.

In both winter and spring jowar, a definite increase in the percentage of households selling produce with increase in operation holdings can be observed. The percentage of households disposing of produce is as high as 46.86 in the size class 10.00-14.99 acres in the case of spring jowar. In the case of autumn jowar no clear trend is discernible; in fact, the small farmers (below 2.5 acres) do not sell jowar at all. It needs to be added, however, that autumn jowar accounts for only 11 per cent of the total output (see note to Table II:7). The evidence clearly indicates that large farmers contribute significantly to the jowar sold on the market.

At this point one could intercede and state: granted, it is the medium and large farmers who sell but most of the sales could be quick disposals, within a month after the harvest; the problem of speculation and hoarding which is in the nature of a commercial crop does not arise. Is such a statement correct? In Table II:7, the percentage of households disposing surplus by intervals is presented.

What we must note from the Table II:7 is that slightly less than half of the households sell their produce within a month after the harvest. And in both autumn and winter jowar, nearly 19 per cent of the households sell within 6 months of the harvest or after.^{4/} As it is obvious

^{4/} The normal period of sale is within 3 months after harvest; we can assume that any surplus held back beyond this period is for speculative purposes.

TABLE II;7

PERCENTAGE DISTRIBUTION OF HOUSEHOLDS REPORTING
 MAJOR PORTION OF THE DISPOSABLE PRODUCE BY
 INTERVALS FOR JOWAR - ALL INDIA

(Percentage)

Interval of disposal	Autumn jowar	Winter ^a jowar	Spring ^a jowar
Within a month after the harvest	41.61	43.31	45.41
Between 1 to 3 months after harvest	40.16	37.49	44.48
Between 3 to 6 months after harvest	10.67	13.94	10.11
Between 6 months to a year after harvest	3.10	5.30	-
More than a year	4.46	-	-

Note: a) Winter and Spring jowar together account for
 89.00 per cent of total production in a year.

Source: NSS Report 202, p.161.

that poor farmers to not have the capacity to hoard, we can safely conclude that this 19 percent would consist mostly of large and medium farmers. A weakness of these data is that they do not indicate the percentage of the total available surplus which is being withheld. We can only conclude that even in the case of jowar a significant percentage of the households do not dispose of their produce immediately after harvest.

The question now arises as to which is the location of sale. The percentage distribution of households by location of sale is presented in Table II:8

TABLE II:8

PERCENTAGE DISTRIBUTION OF HOUSEHOLDS
BY LOCATION OF SALE, ALL-INDIA, 1967-68

(Percentage)

Location	Autumn jowar	Winter jowar	Spring jowar
Spot disposal	11.29	5.17	-
Within the village	41.09	26.73	22.98
Rural area out- side the village	5.02	20.88	14.87
Urban area out- side the village	38.14	47.22	60.13
Others	4.46	-	2.02

Source: NSS Report No.202,p170.

Surprisingly, a very low proportion of the households sell the produce on the farm itself. In the case of spring jowar, the percentage of households selling produce at the farm is negligible whereas nearly 60 percent of the households sell produce in an urban area outside the village.^{5/} Nearly 70 per cent of the households sell winter and spring jowar outside the village. Implicit in this evidence is the fact that a significant proportion of disposable jowar is sold at wholesale markets rather than at smaller markets within the village. If such is the case, we must then evaluate how closely these various wholesale markets are integrated. The extent of integration can be best judged by examining the inter-State movement of jowar and the movement of wholesale price of jowar in the different wholesale markets.

^{5/} The possible inference that there is a significant urban market is not reflected in the consumption data. The average per capita consumption of jowar in urban areas (at the all-India level) in 1973-74 is estimated to be 1.24 kg. and that of rural areas to be 1.62. On the basis of these estimates, it appears that urban areas account for about 16 per cent of the total consumption.

4. Integration of Markets

An examination of the data on the inter-State movement of jowar yields the result that such a movement is not very significant. On the average only 2.9 per cent of the total production of jowar was transferred between the States (See Table II.9). The data cited do not, however, include transportation by road. Hence the actual quantum moved could be much higher than these figures indicate.

With respect to the movement of price of jowar between the various wholesale markets, the correlation seems to be quite high (see Graph II.1) Though the level of prices are different, the general movement of price is similar. We may conclude that the wholesale markets appear to be well integrated judged on the basis of the observed similarity of movement of price of jowar.^{6/} This may appear somewhat anomalous in the light of the data on inter-State movements. However, it may be noted that even in the case of rice and wheat the grain markets appear to be quite well integrated notwithstanding a low quantum of inter-State movement. The reason could be that urban markets, in the direction of which most of these movements take place, determine the levels of price.^{7/}

^{6/} For a more detailed study of market integration see Uma Lela, "Market Integration: A Study of Sorghum Prices in Western India", or Foodgrain Marketing in India: Private Performance and Public Policy, London: Cornell University Press, 1971.

^{7/} For an elaboration of this argument, see Porverty, Unemployment and Development Policy, A Case Study of Selected Issues with reference to Kerala, United Nations, 1975, Chapter I.

TABLE II.9

INLAND MOVEMENT OF JOWAR, ALL INDIA, 1960-61 TO
1973-74

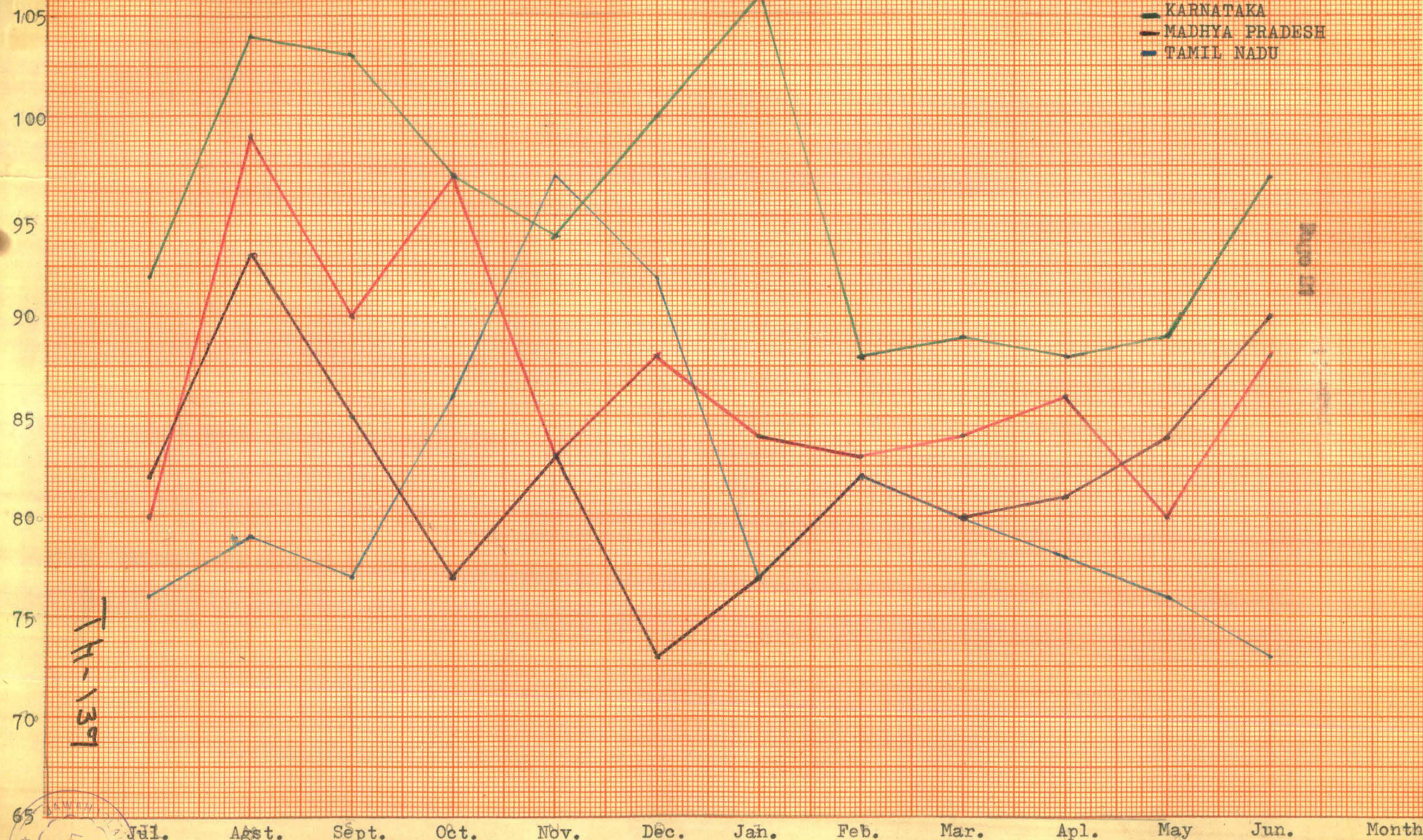
Year	Total (tonnes)	As % of Production
1960-61	226,724	2.3
1961-62	231,074	2.9
1962-63	219,689	2.2
1963-64	330,999	3.6
1964-65	136,394	1.5
1965-66	54,200	0.7
1966-67	321,817	3.5
1967-68	290,848	2.9
1968-69	242,860	2.5
1969-70	181,819	1.9
1970-71	259,162	3.2
1971-72	186,839	2.4
1972-73	88,585	1.3
1973-74	241,465	2.7

Source: Compiled from data in Bulletin on Food Statistics.

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GRAPH II:1 - WHOLESALE MARKET PRICES OF JOWAR, 1971-72

— ANDHRA PRADESH
— KARNATAKA
— MADHYA PRADESH
— TAMIL NADU



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5. Conclusion

In summary, let us review briefly what has been established in the course of our analysis. We have established that a significant proportion of the demand is generated by the poorer sections of the rural population which are very dependent on the market for meeting their consumption requirements of food-grains. More precisely, there does exist a market demand for jowar. On the production side, the fact of concentration of production on larger sized holdings was established. It was also shown that nearly half of the medium and large farmers sell their produce whereas as on the average only 20 per cent of the small farmers sell their produce. Both these facts together imply that a significant proportion of jowar is produced for the market. At this point we can conclude that jowar is of a commercial nature because there is not only a significant demand which can be only satisfied through the market but also a significant proportion of the output is destined for the market. Additional evidence on the time interval and location of disposal, and integration of different wholesale markets further strengthen this conclusion: that jowar is no different from rice and wheat from the market - and hence social - point of view.

Once it is established that jowar is destined for the market, it is crucial to study the nature of fluctuations (both seasonal and temporal) in the price of jowar and the underlying explanatory variables.

CHAPTER III

NATURE OF FLUCTUATIONS IN PRICE OF JOWAR

Before analysing the intra-year and inter-year fluctuations in the price of jowar, let us briefly clarify the conceptual framework within which we are working. A fundamental principle of demand-supply analysis in neo-classical economics is that with a given demand for a particular commodity the increase in the supply of that commodity will lead to a fall in its market price. An inferior good is defined as a good whose consumption declines with a fall in the price of that good; in technical terminology - the income effect dominates the substitution effect. As a result the consumption of other goods increases and the price of the inferior good falls further with a decreased demand. Therefore, in the case of an inferior good, there is a second round effect (on demand) of the price fall resulting from an increase in supply. This implies that the movement of price of an inferior cereal should be marked with wild fluctuations.

The theory holds that this reasoning is valid in the case of an agricultural commodity. Markets for agricultural commodities have also seasonal components which lead to inter-year fluctuations, which must be considered. Such fluctuations in respect of prices can be measured by two variables - the seasonal rise and the seasonal fall. The former refers to the rise that takes place from the harvest period (when prices are expected to be low) to a period of low availability (before the

next harvest). That is, it is a percentage difference between the peak and trough prices in a marketing year.^{1/} On the other hand, the seasonal fall refers to the fall that takes place with in the price from the period of low availability to the level in the next year's harvest period. In other words, it is the percentage difference between last year's peak price and this year's ϕ trough price. The expected effect of supply on these two types of seasonal change can be summarised as follows:

"Roughly speaking the pressure of severe shortage should get reflected in a small seasonal fall and a large seasonal rise; similarly bumper crops are expected to bring about large decreases and small increases in the peak and lean^{season} prices respectively." ^{2/}

Based on this understanding of market functioning, the focus of this chapter will be to study variations in production of jowar and related fluctuations in its price. This study will be divided into three sections: 1) the first section will be a cursory glance at the relationship between price and output of jowar; 2) the second shall examine the inter-year fluctuations; and 3) role of State procurement policy, pattern of market arrivals and demand for stocks shall be examined in the final section. In this chapter, then, the role of supply (and factors affecting it) in explaining the variations in price of jowar shall be fully examined; the role of consumer demand shall be considered in the next chapter.

^{1/} The seasonal change may occur within less than one year. The year itself is a very difficult concept to define, mainly because the marketing and the agricultural year do not coincide. For convenience of comparison between price and output, our analysis is based on the agricultural year.

^{2/} N.Krishnaji, "State Intervention and Foodgrain Prices", op.cit.p.83

1. Price and Output of Jowar

The annual production, the farm harvest price and the maximum and minimum wholesale price of jowar are presented in Tables III: 1-4 for the four States, Andhra Pradesh, Karnataka, Madhya Pradesh and Tamil Nadu.^{3/}

These data show that in general prices rise in response to decreases in output; but what is interesting is that prices generally rise even in periods characterised by increasing output.

To analyse this relationship in greater detail we have classified the whole period into years in which output has increased over the previous and these in which it has fallen and measured the corresponding price changes. Table III:5 shows that, for example, in Madhya Pradesh, a mean rise of 7.8 per cent (over the previous year) in the farm harvest price was associated with a mean output rise of 36.3 percent (the mean being taken over all the years in which output has increased over the previous year). Much the same kind of relationship holds in respect of the other three States also. On the contrary, in general, a fall in output is associated with an increase in the farm harvest price. This non-correspondence between price and output is reflected in the fact that the correlation

^{3/} The maximum and minimum wholesale prices are simply the highest and lowest prices respectively in the corresponding agricultural year.

TABLE III:1

ANNUAL PRODUCTION, FARM HARVEST PRICE, AND MAXIMUM AND
MINIMUM WHOLESALE PRICE OF JOWAR 1954-55 TO 1973-74,
ANDHRA PRADESH

Year	Production of jowar (thousand tonnes)	Farm Harvest Price (Rs. per quintal)	Maximum whole- sale price (Rs.per quintal)	Minimum whole- sale price (Rs.per quintal)
1954-55	1262	20.11	48.88	15.41
1955-56	1150	24.14	32.99	20.61
1956-57	1108	34.34	40.20	36.85
1957-58	1274	32.25	34.68	26.96
1958-59	1466	33.16	36.69	28.45
1959-60	1477	36.47	39.34	32.16
1960-61	1334	34.15	41.70	31.52
1961-62	1447	36.17	38.03	28.00
1962-63	1405	35.28	41.00	32.00
1963-64	1403	39.39	52.80	31.00
1964-65	1138	54.14	75.00	54.50
1965-66	1016	56.81	69.50	50.10
1966-67	1553	59.02	51.10	50.10
1967-68	1197	61.23	70.00	51.10
1968-69	1320	61.01	95.00	62.00
1969-70	1351	57.45	75.00	52.00
1970-71	967	62.40	80.00	52.00
1971-72	1140		97.50	89.00
1972-73	1230		106.00	95.00
1973-74	1322		155.00	100.00

Source: Compiled from Bulletin on Food Statistics, Estimates of Area and Production of Principal Crops in India and Annual Farm Harvest Prices of Principal Crops in India, Directorate of Economics and Statistics, Government of India, various years.

TABLE III:2

ANNUAL PRODUCTION, FARM HARVEST PRICE AND MAXIMUM
AND MINIMUM WHOLESALE PRICE OF JOWAR, 1954-55 TO
1973-74, KARNATAKA

Year	Production of jowar (thousand tonnes)	Farm Harvest Price (Rs. per quintal)	Maximum whole-sale price (Rs. per quintal)	Minimum whole-sale price (Rs. per quintal)
1954-55	1347	21.36	32.61	15.57
1955-56	950	24.35	41.00	21.25
1956-57	851	33.80	53.60	39.34
1957-58	1149	29.37	45.56	25.46
1958-59	1059	33.21	36.85	32.61
1959-60	1164	34.68	42.88	37.52
1960-61	1153	38.58	45.56	34.00
1961-62	1114	42.08	44.00	33.50
1962-63	1357	39.63	54.00	40.00
1963-64	1428	44.48	58.50	40.00
1964-65	1550	63.23	91.00	56.00
1965-66	1233	76.46	86.00	72.00
1966-67	1428	65.93	76.00	61.00
1967-68	1438	74.01	90.00	66.00
1968-69	1637	69.51	94.00	75.00
1969-70	1800	61.23	79.00	65.00
1970-71	2024	71.16	103.00	77.00
1971-72	1861		106.00	88.00
1972-73	1082		177.00	107.00
1973-74	1697		195.00	133.00

Source: Same as for Table III:1.

TABLE III:3

ANNUAL PRODUCTION, FARM HARVEST PRICE, AND MAXIMUM AND
MINIMUM WHOLESALE PRICE OF JOWAR, 1954-55 TO 1973-74

MADHYA PRADESH

Year	Production of jowar (thousand tonnes)	Farm Harvest price (Rs. per quintal)	Maximum whole-sale price (Rs. per quintal)	Minimum whole-sale price (Rs. per quintal)
1954-55	1092	18.37	16.08	13.40
1955-56	785	25.77	40.20	16.75
1956-57	1102	34.76	39.53	34.49
1957-58	1407	28.70	30.82	22.78
1958-59	1265	30.92	37.84	30.82
1959-60	1161	31.80	41.54	32.35
1960-61	1480	29.37	41.19	30.07
1961-62	881	30.44	40.41	31.00
1962-63	1521	30.68	40.12	27.00
1963-64	1327	39.89	42.00	30.00
1964-65	1728	42.59	47.00	37.00
1965-66	1314	42.86	40.50	40.50
1966-67	1381	46.14	47.50	40.50
1967-68	2084	53.09	104.00	55.00
1968-69	1812	54.14	77.00	47.00
1969-70	1467	69.15	77.00	70.00
1970-71	1336	66.52	73.00	52.00
1971-72	1244		93.00	73.00
1972-73	1746		106.00	60.00
1973-74	1157		155.00	100.00

Source: Same as for Table III:1.

TABLE III:4

ANNUAL PRODUCTION, FARM HARVEST PRICE, AND MAXIMUM AND
MINIMUM WHOLESALE PRICE OF JOWAR 1954-55 TO 1973-74
TAMIL NADU

Year	Production of jowar (thousand tonnes)	Farm Harvest price (Rs. per quintal)	Maximum whole-sale price (Rs. per quintal)	Minimum whole-sale price (Rs. per quintal)
1954-55	590	23.95	29.48	20.10
1955-56	487	27.74	33.50	22.78
1956-57	480	31.40	40.20	38.35
1957-58	542	30.49	43.87	38.86
1958-59	560	31.75	43.87	32.23
1959-60	631	36.42	45.13	36.55
1960-61	546	35.91	50.00	40.00
1961-62	601	36.63	47.03	40.00
1962-63	590	35.23	48.02	34.41
1963-64	572	42.10	50.54	33.34
1964-65	552	51.71	86.65	51.61
1965-66	501	56.64	73.91	52.00
1966-67	559	50.00	52.00	52.00
1967-68	558	50.00	82.00	52.00
1968-69	468	71.24	91.81	66.76
1969-70	575	69.80	98.95	69.78
1970-71	547	65.93	75.55	64.51
1971-72	515		95.32	73.33
1972-73	537		91.10	70.08
1973-74	562		165.15	79.29

Source: Same as for Table III:1

coefficients between per cent change in farm harvest price and per cent change in output are insignificant for Andhra Pradesh, Madhya Pradesh and Tamil Nadu (See Table III:7). The coefficient in respect of Karnataka was, however, of the order of -0.61.

2. Seasonal Fluctuations

We shall now turn to the behaviour of seasonal changes in the price. To calculate seasonal rise and fall, a preliminary but cursory examination was undertaken to determine in which months the peak and trough prices occurred. On the basis of such an examination, an average of January-March prices was taken to represent the trough prices and the average of July-September prices to represent the peak prices.^{4/} Table III:5 details the mean output rise or fall and the corresponding mean changes in farm harvest price, the seasonal fall and the seasonal rise. As stated previously an output rise in all States was characterised by a rise in the farm harvest price, contrary to expectations. On the other hand, the seasonal fall behaved in the expected direction though not of the expected degree. In Madhya Pradesh, an average output rise of 37.8 percent was associated with a seasonal fall of only 17.1 percent. Concerning seasonal rise, the interesting fact to note is that the extent of seasonal rise

^{4/} The choice of these months is further supported by the fact that rice arrivals begin in October and prices begin to decline in November-December. Further wheat arrivals begin in April so that by July-August prices generally begin to rise.

TABLE III:5

AVERAGE PRICE CHANGE IN OUTPUT AND PRICE, 1955-56 TO 1973-74^A

(percentage)

State	Output fall		Change in FHP		Output rise		Change in FHP		Output fall		Seasonal fall	
	Mean	Stand- ard de- viation (s.d)	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Andhra												
Pradesh	-11.6	8.70	+13.1	15.55	+14.7	16.32	+1.7	20.71	-11.1	9.06	+7.8	25.57
Karnataka	-11.6	9.62	+17.8	9.64	+11.8	9.82	+3.7	9.82	-14.6	14.07	+18.5	39.09
Madhya												
Pradesh	-17.4	11.36	+10.4	13.77	+36.3	19.76	+7.8	15.89	-18.1	11.42	+13.5	33.48
Tamil Nadu	-7.9	5.84	+12.5	15.94	+10.4	5.95	+0.7	7.99	-7.8	5.86	+7.4	16.74

.....32/-

TABLE III:5 (Contd.)

State	Output rise		Seasonal fall		Mean output fall	Seasonal rise		Mean output rise	Seasonal rise &	
	Mean	s.d.	Mean	s.d.		Mean	s.d.		Mean	s.d.
Andhra Pradesh	+9.0	5.04	-5.5	9.02	-11.1	+18.0	22.96	+9.0	+14.1	12.53
Karnataka	+15.9	15.96	-8.2	3.56	-14.6	+14.6	15.97	+15.9	+14.1	17.58
Madhya Pradesh	+37.8	19.52	-17.1	18.20	-18.1	+17.2	7.62	+37.8	+30.9	39.58
Tamil Nadu	+8.9	8.07	+6.8	13.41	-7.8	+7.0	19.04	+8.9	+15.4	25.44

Notss: A. Mean output fall refers to the average % fall in output, the average being taken over the years where output fell. Similarly for mean output rise, mean change in FHP, mean seasonal fall and mean seasonal rise. Those years which registered no seasonal fall and no seasonal rise due to control prices were excluded from the calculations.

Source: Calculated from price and production data from Bulletin on Food Statistics

was as great or greater in the case of an output rise as in the case of a comparable output fall. In Tamil Nadu, an average output fall of 7.8 per cent was associated with a seasonal rise of 7.6 per cent whereas an average output rise of 8.9 per cent, was associated with a seasonal rise, on the average, of the order of 15.6 per cent. And this pattern was repeated in all the other States. As the standard deviations indicate, averaging was done over very disparate numbers and the confidence that can be attached to these figures as indicating a trend is somewhat problematic.

But Table III:5 shows conclusively that when output falls prices move in the opposite direction and the magnitude of change is in general more than proportionate. This implies that incomes do not suffer as a consequence of decreases in output, whatever may be the reasons for the latter. On the other hand, what is more significant is that even in periods when output rises, prices also move in the same direction, at least on the average, so that in the long run incomes do not shrink. Thus there is no evidence to suggest that incomes tend to fluctuate wildly in opposite directions in response to changes in production and price.

So far we have considered output increases without considering the increase in demand due to population growth. This is to say that a rise in the output need not always imply a fall in prices (e.g. the rise in production may be minimal and per capita production may actually fall leading to a price rise). To account for the rise in demand due to population growth, we shall only examine those years in which growth in production was significantly greater than the rise in population, i.e. those years in which percapita production rose significantly.^{5/}

In the period 1951 to 1971, the compound growth rate of population has ranged from 2.1 to 3.0 per cent in the four States and at the all-India level. In Table III:6 the changes in prices associated with a rise in per capita production (to a significant extent) are detailed.

^{5/} Since the expenditure elasticity of jowar is near zero, the only factor, besides substitution between jowar and superior cereals, that can promote demand is population growth. We shall return to this point in the next chapter.

TABLE III:6

SIGNIFICANT OUTPUT RISE AND CORRESPONDING
PRICE CHANGE (OVER ALL STATES)

(Percentage)				
Output rise	Year in which the rise took place	Change in Farm har- vest price	Seasonal Fall	Seasonal Rise
21.8	1962-63	-5.8	-6.3	-12.8
22.9	1969-70	-2.0	-14.4	+12.9
35.0	1957-58	-13.1	-13.2	+12.2
40.4	1956-57	+32.9	-8.5	-14.8
	1972-73		-28.3	+ 53.1
50.9	1967-68	+15.1	-42.2	+13.5
72.6	1962-63	+ .8	-26.6	+10.0

As the degree of output rise increases there is no clear pattern of behaviour for prices. It can be seen that even in the years in which production increased by over 40 per cent, the farm harvest price actually rose over the previous year's. Though output had risen by 726 per cent in 1962-63, the impact on farm harvest price was marginal; the seasonal changes associated with such an abnormal increase in production appear to be not very different from those corresponding to much smaller increases in output. What this table clearly demonstrates is the abnormal behaviour of seasonal rise and seasonal fall with a significant increase in output. This is further

reflected in the fact that when we consider the whole period (i.e., 1955-56 to 1973-74) the correlation coefficients between output on the one hand and seasonal fall and seasonal rise on the other are insignificant in almost all cases (See Table III:7).

TABLE III:7

CORRELATION COEFFICIENTS BETWEEN OUTPUT AND
PRICE CHANGES: 1955-56 TO 1973-74

State	r_1	r_2	r_3
Andhra Pradesh	-.22	-.15	-.14
Karnataka	-.61	-.50	-.21
Madhya Pradesh	-.10	-.62	+.30
Tamil Nadu	-.50	-.21	+.01

Note: r_1 - Correlation between per cent change in FHP and percent change in output
 r_2 - Correlation between seasonal fall and percent change in output
 r_3 - Correlation between seasonal rise and percent change in output.

We can conclude from the evidence so far presented that the quantified behaviour of both seasonal rise and seasonal fall associated with a rise in output (even after accounting for population growth) has not conformed to our expectations based on a theoretical understanding of market functioning. It is crucial then to delineate the factors which determine the seasonal changes in price.

3. Role of Procurement Policy, Market Arrivals and Demand for Stocks

Factors which have a bearing on the two types of seasonal change are among others, State operations (via procurement policy), pattern of market arrivals and hoarding for speculative purposes (demand for stocks). Of course, all the three factors are inter-linked as shown in the case of wheat.^{6/} The procurement price of wheat was so remunerative during the period 1968-71 that the pattern of market arrivals changed heavily in favour of maximum arrivals in the peak season. This, of course, implied that stock holding \downarrow had declined during this period. The changes in the procurement price determined to a large extent the behaviour of seasonal rise and fall. Was there a similar situation in the jowar market?

^{6/} N.Krishnaji, "State Intervention and Foodgrain Prices", op.cit.

Procurement policy for inferior cereals (including jowar) has been more or less an ad hoc measure allied to the general procurement policy of rice. The report of the Agricultural Prices Commission on the price policy for Kharif cereals for 1967-68 season, called for the first time, an increase in the procurement of coarse cereals. This call was on the basis of a decision to encourage substitution from imported wheat to coarse cereals. In latter reports, the call for procurement of these cereals was based ϕ more clearly on the need to protect producers of these cereals as relative prices were shifting in favour of rice and wheat.^{1/} Both motivations, increasing procurement and protecting producers, necessitated an increase in the procurement price. Between 1967-68 and 1973-74, the procurement price of jowar was increased from Rs.52 to Rs.70 per quintal.

The non-remunerativeness of the procurement price of jowar can be established by noting the inability of Government authorities to procure a significant percentage of the production of jowar. (See Table III:8). On the average during 1964-74 only 3.1 per cent of the production

^{1/} See Agricultural Prices Commission, Report on Price Policy for Kharif Cereals for the 1971-72 Season, Ministry of Food and Agriculture, Government of India, September 1972, pp.12-14.

TABLE III:8

INTERNAL PROCUREMENT OF JOWAR, 1964-65 TO 1973-74
ALL INDIA

Year	Procurement (thousand tonnes)	Percentage of production
1964-65	377	3.9
1965-66	483	6.4
1966-67	616	6.7
1967-68	391	3.8
1968-69	331	3.4
1969-70	203	2.1
1970-71	65	0.8
1971-72	26	0.3
1972-73	161	2.3
1973-74	150	1.7

Source: Compiled from Bulletin on Food Statistics, various issues.

of jowar has been procured; the producers presumably preferred to operate in the open market. This preference can be easily understood by noting that in Andhra Pradesh, Karnataka, and Tamil Nadu the minimum wholesale price was well above the procurement price in the period

1967-68--1973-74 (See Tables III: 1, 2 and 4). The non-remunerativeness of the procurement price is further reflected in the non-alteration of the pattern of market arrivals since the beginning of the policy of procurement.

TABLE III:9

PATTERN OF MARKET ARRIVALS OF JOWAR,
ALL INDIA

(Percentage)

Year	Proportion of arrivals in			
	October- December	January- March	April- June	July- September
1967-68	18.8	39.7	28.2	13.4
1968-69	24.6	45.6	19.5	10.3
1969-70	29.2	36.0	20.1	14.7
1970-71	24.5	35.1	22.7	17.8
1971-72	33.5	29.2	21.6	15.6
1972-73	23.4	38.6	20.4	17.6
1973-74	18.2	35.9	26.8	19.1

Source: Compiled from Bulletin on Food Statistics

The only conclusion one can draw from this evidence is that the procurement price was non-remunerative and procurement policy cannot explain the observed abnormal behaviour of seasonal changes in price.

The demand for stocks is thus ^{the} only factor left unconsidered, and its role can be established only by inference. The very fact^{8/} of a small seasonal fall in the case of a rise in output implies the existence of hoarding for speculative purposes.^{8/}

TABLE III:10

CHANGES IN THE SEASONAL FALL IN PRICES,
1967-68 TO 1973-74

Year	Andhra Pradesh	Karnataka	Madhya Pradesh	Tamil Nadu
1967-68	+24.9	-4.7*	-42.2*	-
1968-69	-19.8	-8.9*	-6.2	+19.3
1969-70	-11.3	-4.4*	-3.1	-14.4*
1970-71	+17.7	+8.9*	-2.9	+0.4
1971-72	-6.7*	-5.4	-9.9	+3.3
1972-73	-0.8*	+15.1	-28.3*	+17.1*
1973-74	+1.2*	-13.7*	-29.6	+30.5*

*Years in which there was an increase in output

Table III:10 gives the seasonal fall in wholesale prices for the period 1967-68 to 1973-74. It can be seen

^{8/} If the average monthly price and average market arrivals for the period 1963-64 to 1973-74 are plotted together, we find that prices are rising at a time of peakmarket arrivals. In other words, seasonal fall is decreasing.

that in Andhra Pradesh, the seasonal fall in general exhibited a declining trend and finally turned positive; it may be noted that the last three years of the period were characterised by an increase in output. In Tamil Nadu, a similar pattern is noticed from 1970-71 itself. These changes are abnormal in the sense that in general prices are expected to fall during the harvest period irrespective of the size of the harvest; the observed changes resulting from a rise in prices even during the harvest period, must accordingly be attributed to accumulation of stocks.

We have thus shown that procurement price had no role to play in the determination of seasonal changes in the price of jowar. It has also been established that the pattern of market arrivals has remained virtually unchanged. From this we can only conclude that the demand for stocks has played a significant role in determining both the seasonal fall and seasonal rise in prices.

4. Conclusion

In this chapter, we have clearly established the peculiar phenomenon of a decreasing seasonal fall and significant seasonal rise in prices in years of output increase. Furthermore, we have shown that procurement

policy and pattern of market arrivals cannot explain the above-described phenomenon. By inference, we have established that demand for stocks is a crucial explanatory variable.

To end, we wish to state that much of the analysis in this chapter ignored demand factors. The analysis has shown that output by itself cannot fully explain the observed fluctuations (both seasonal and temporal) in the price of jowar. The demand for stocks, a factor affecting actual supply, thus becomes important for the type of seasonal fluctuations observed in the price of jowar. For a clearer understanding of all the variables affecting the temporal fluctuations in the price of jowar, the analysis must now turn to a consideration of variables determining demand.

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CHAPTER IV

THE ROLE OF DEMAND FACTORS

The price of jowar at the all-India level has experienced a continuous rise since the beginning of the 'sixties. The price rise was of the order of 200 per cent between 1961-62 and 1973-74 or nearly 17 per cent per annum. The focus of this chapter will be to study the factors underlying this temporal rise in the price of jowar.

Excess demand (i.e., the excess of demand over supply) is the factor one must consider to explain a rise in the price of a commodity. Unfortunately we have neither adequate data to measure the actual gap nor, in the case of jowar, a suitable proxy.^{1/} Therefore, the analysis must proceed by examining supply and demand factors separately.

Production of jowar has been subject to strong fluctuations and therefore any trend measurement is meaningless. From 1961-62 to 1964-65, production rose from 8029

^{1/} In the case of wheat, Krishnaji used the quantum of public distribution of foodgrains as a proxy. But in the case of jowar this would not be justified because very small quantities of jowar are actually distributed through the system. A more practical problem is that separate data for jowar are not available. See N.Krishnaji "Wheat Price Movements: An Analysis", op.cit.

to 9683 thousand tonnes. Then in 1965-66 production fell sharply to 7581 thousand tonnes. A similar pattern was repeated from 1966-67 to 1969-70. Production then declined steadily in the next three years and rose sharply in 1973-74 to 8992 thousand tonnes. Over the whole period, beginning in 1961-62, there was a slight increase in the production of jowar — about one per cent per annum. Given this near stagnation in the production of jowar, we can assume that any increase in demand, during the period resulted in excess demand leading to a price rise.

The change in demand for a commodity is the result of three factors: (1) a change in income, (2) growth in population and/or (3) change in the prices of other goods. In² chapter II, we had shown that the distribution of consumption of jowar over expenditure groups was nearly zero. Actual calculations yield an elasticity of 0.002 in 1973-74 and of even a smaller magnitude in 1961-62.^{2/} Hence changes in demand due to changes in expenditure (or income) can be considered to be virtually nil in the case of jowar.

The rise in demand due to growth in population is roughly equivalent to the rate of increase in population. Between 1961-62 and 1973-74, the population increased at a rate of 2.5 per cent per annum. The corresponding price rise, in this period, as

^{2/} The NCAER has estimated the income elasticity of demand for jowar 0.14 and 0.04 for development and non-development areas. This indicates our calculations are not widely of the mark. See NCAER, All India Consumer Expenditure Survey, Vol. II, New Delhi, 1967, Chap.9.

stated previously, was 17 per cent per annum. The question, then is can we attribute this price rise to the increase in demand due to the growth in population. To account for more precisely the increase in demand due to population growth, we shall consider per capita production (see Table IV:1). A sharp decline in per capita production can be observed, especially in the period from 1967-68 to 1972-73. In this latter period, per capita production declined from 19.4 kgs. per year to 12.1 kgs. per year. Furthermore, in the same period, the index of wholesale prices rose from 197 to 242, though it was a rise subject to minor fluctuations. Based on this observed correlation, a regression of price of jowar on per capita production of jowar was run. Contrary to our expectations, the results are bleak with the R^2 being only 0.39 and the regression coefficient being insignificant. From this evidence, we can only infer that the price rise in jowar cannot be fully explained by a rise in demand following the growth of population.

A third factor that affects the demand of a commodity is the prices of close substitutes. Jowar is a substitute for rice or wheat in most States. So long as price differentials exist between superior and inferior cereals, with an increase in the prices of rice and wheat we can expect some substitution to take place in favour of inferior cereals such as jowar. The prices of rice and wheat have been also increasing but at

TABLE IV:1

PRICES OF RICE, WHEAT AND JOWAR AND PRODUCTION
OF JOWAR, ALL INDIA, 1961-62 TO 1973-74

Year	Index of wholesale prices of jowar (1961-62= 400)	Production of jowar (thousand tonnes)	Per Capita production of jowar (kgs./year)	Index of wholesale prices (1961-62 = 100)	
				Rice	Wheat
1961-62	100	8029	17.8	100	100
1962-63	115	9748	21.1	105	98
1963-64	103	9198	19.5	118	106
1964-65	165	9683	20.1	127	138
1965-66	167	7581	15.4	137	149
1966-67	171	9224	18.3	169	178
1967-68	197	10048	19.4	200	214
1968-69	185	9804	18.6	196	204
1969-70	192	9721	18.0	196	215
1970-71	190	8105	14.7	201	209
1971-72	210	7722	13.7	204	208
1972-73	242	6968	12.1	231	222
1973-74	300	8992	15.3	283	226

Source: Bulletin on Food Statistics and Reserve Bank of India Bulletin, RBI, Government of India, various years.

levels higher than the price of jowar (see Tables IV: 1 and 2). There were, of course, years in which the price of jowar was higher than the price of rice or wheat. For example, in Karnataka, in 1973, the price of jowar was ₹ Rs.161.58 per quintal whereas it was Rs.143.46 per quintal for coarse rice. But the broad trend remains and therefore additional pressure on the limited supply of jowar must have been created. To test to what extent this additional demand through substitution could explain the rise in jowar price, a regression was run with price of jowar as a dependent variable and per capita production of jowar and price of rice as independent variables. As expected, the R^2 was 0.92. Other combinations of variables were also tested and the coefficients of determination are given in the Table IV:3.

A point to note is that the R^2 improves considerably with the introduction of ^aprice variable. We can, therefore, conclude that the price of rice and wheat are crucial in explaining the price rise of jowar.^{2/}

^{2/} In fact for Andhra Pradesh data alone, it was found that R^2 was 0.95 when only the price of rice was introduced as an independent variable.

TABLE IV:2

PRICES OF JOWAR, COARSE RICE AND WHEAT, ANNUAL AVERAGE,
1968-1974

(Rs. per quintal)

Year	Price of jowar	Price of coarse rice	Price of wheat
<u>Andhra Pradesh</u>			
1968	70.83	89.07	
1969	64.04	105.32	
1970	62.82	89.08	
1971	81.08	111.00	
1972	94.42	127.83	
1973	102.80	166.50	
1974	141.00	168.60	
<u>Karnataka</u>			
1968	78.83	123.08	
1969	74.73	111.67	
1970	80.92	89.33	
1971	94.00	108.00	
1972	105.08	113.92	
1973	161.58	143.46	
1974	161.84	180.88	
<u>Madhya Pradesh</u>			
1968	57.92	103.17	95.42
1969	70.75	97.58	87.33
1970	68.17	106.33	85.08
1971	75.91	100.00	83.00
1972	83.43	115.33	86.50
1973	95.01	144.58	87.87
1974	159.17	216.92	148.50

Source: Compiled from data in Bulletin on Food/
Statistics.

TABLE IV: 3
 MULTIPLE CORRELATION COEFFICIENTS

Independent Variables	R ²
$(X_1 - X_4, X_4)$.390863
$(X_2 + X_3, X_4)$.401832
(X_4, X_5)	.921095
(X_4, X_6)	.790024
(X_4, X_7)	.896045
$(X_4, X_2 + X_3, X_2)$.896097

Notes:

- X_1 = per capita availability of all cereals
 X_2 = per capita availability of rice
 X_3 = per capita availability of wheat
 X_4 = per capita production of jowar
 X_5 = index of wholesale prices of rice
 X_6 = index of wholesale prices of wheat
 X_7 = weighted average of X_5 and X_6
 Dependent variable = index of wholesale prices of jowar.

A possible explanation for this correlation could be the following. When the price of rice increases, given the very large differential between price of rice and jowar, some additional demand for jowar is created. On the supply side, farmers taking cognizance of the rise in prices of rice expect the price of jowar to also ϕ increase. With the expectation of a price rise, they hold back stocks further shapening the price rise. As we have previously shown, the conditions for hoarding do exist in the jowar market. A significant proportion of jowar is cultivated on large farms. We have already cited the fact that nearly 20 per cent of the households withhold stocks to sell on the market six months (or more) after the harvest. Furthermore, we have also established that the nature of seasonal fluctuations in the price of jowar indicates the existence of a demand for stocks.

To conclude, our main argument is that though demand-supply factors are relevant in explaining the price of jowar, we cannot neglect the importance of demand for stocks. Since a considerable part of jowar marketing is in rural areas, it is difficult to satisfactorily "explain" its functioning with the absence of adequate data. Through necessity, we have to rely on indirect arguments to establish our hypothesis that given a general atmosphere of rising price expectations, demand for stocks plays a crucial role in the jowar market.

CHAPTER V

CONCLUSION

In conclusion, let us briefly review what we have done so far. First, the commercial nature of jowar has been clearly established. Not only does production of jowar occur to a significant extent on large-sized holdings but also the incidence of marketing of jowar is higher in these same holdings. Furthermore, we have established that nearly 20 per cent of the households market their produce between six months and a year from the harvest period. Finally, we have shown that a significant proportion of all households market their produce not at the village market but at a wholesale market outside the village.

Given the commercial nature of jowar, our examination of seasonal fluctuations in price of jowar indicated the existence of a demand for stocks. The abnormal behaviour of seasonal fall in prices could not be adequately explained by either output fluctuations or by State intervention (via procurement policy). By inference, we concluded that stocks have played on an important role in price determination.

Finally our examination of the temporal rise in the price of jowar and the factors underlying this rise has again indicated the role of hoarding (in both a direct and indirect manner) in the jowar market. Demand factors such as increase in demand due to population growth and substitution demand,

though important, could not fully explain the rise in the price of jowar. Therefore, by inference, we established the role of stocks in the jowar market.

Our hypothesis that in an environment of rising price expectations, there is a tendency to demand for stocks to rise, has not been disproven. ~~∧~~ We conclude that jowar is no different from rice and wheat from the market - and hence social - point of view.

In the light of the above findings and the experience of the functioning of the wheat market, following a vigorous procurement drive in a period of relative abundance a policy that is supposed to ensure a fair price to both producers and consumers is of little relevance. In the case of wheat the procurement price in reality played the role of a minimum support price and thus protected the interests of the producer; it, by no means, ensured a fair price to the consumer. Similarly any attempts to improve the production of jowar need not necessarily result in a lower price for the consumer. The experience in the rice and wheat markets during a period of peak availability substantiates our conclusion.

To conclude, the two major findings of our study are:

(1) jowar is not simply a subsistence crop produced and consumed by low-income farm families but rather is no different from rice or wheat from a market point of view; and (2) the market functioning of jowar is similar to that of rice and wheat, i.e. the demand for stocks has a crucial role to play in the determination of the price.