Determinants of Behavioural Propensities of Farmers in India : A Comparative Study of Haryana and Punjab Farmers with Respect to Consumption and Sales of Food-Grains in Post-Green-Revolution Period

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To Those Who IMbibe
Learning and Research Work
in Me

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CONTENTS

INTRODUCTION

INTRODUCTION

Economic structures of developing countries are highly dualistic and the dualism is not confined to any specific segment of the economy. These economies have sectoral, inter and intra regional, class and group dualism. Whereas manufacturing sector is modern and developed, agricultural sector is backward, by and large. Consequently, a majority of the people engaged in this sector lives in pools of back-waters. In fact, a large number of peasants are employed in subsistence farming with the result that many of them are not able to meet even their own requirements for foodgrains, which are the staple diet of practically the entire population of countries like India (37).

Agricultural sector is considered as the largest contributor to domestic output and an absorber of the largest proportion of total labour force. Hence, output and prices of food-grains play a pivotal role in developing countries. The major bones of contention among economists have, however, been the determinants of prices and income. Inflation not only emanates from agricultural sector but it has also percolated therefrom to the other sectors of the economy. Therefore, for an understanding of the genesis of inflation in developing countries, it is imperative to study determinants of food-grain prices.

Keynesian theory or new classical propositions or pure price models have proved inadequate to explain properly the persistence of inflationary pressures in various production sectors. This necessitates a careful evaluation of the conceptual framework and the analytical tools that are appropriate for telescoping the essential features of the behaviour pattern of the economy in general and price movements in particular. Aggregative analysis may not be adequate to explain properly the structure and price movements in the economy. Hicks (33) for the first time distinguished between flex prices and fix prices.

Flex prices are determined by the configuration of their supply and demand. Same is the case of food-grains prices. Supply of food-grains is not determined by output alone. In fact, supply comprises of marketed surplus plus changes in stocks. Thus, changes in stocks affect the balance equation in general equilibrium system. Therefore, market supply can not be estimated from individual preference function alone [33]

Mathur-Ezekiel propounded the hypothesis that in developing countries farmers sell that amount of output which will provide them sufficient amount of cash they want; they retain the rest for their own consumption. With the increase in output and prices, farmers sell less and with the fall in output and prices they sell more.

Thus, marketable surplus tend to move in opposite direction. With the increase in output, they want to satisfy their pent up demand. This makes the short-run supply curve backward bending and consumption curve positively upward sloping (25).

This hypothesis has earlier been tested by Krishnan and Tripathi for all India and for Punjab farmers. The objective of the present study is to estimate the farmers' propensities to consume, and sell food-grains in different price and income situations, as it is essential to know the mechanics of change in prices. We want to test the hypothesis at all India as well as at regional level. Study for Punjab has already been completed; so we have selected the Haryana State for regional variations. For this study, we have taken the pre-green revolution period for all India and post-green revolution period for Haryana. Krishnan in his study has covered the period till 1959; but we extended it to 1965 in order to study the whole pre-green revolution period. Studies on post-green revolution period at all India level and on pre-green revolution period for Haryana will be taken up in subsequent period. As post-green revolution period is known as the period of high rate of growth of output and income, it is expected that farmers' behaviour with respect to consumption and sales will be different in the later period. Hence the objective is to make an assessment of the behaviour pattern of farmers both qualitatively and quantitatively.

The organisation of the study is as follows:

First chapter deals with the review of literature. Chapter II deals with detailed mathematical model to estimate demand and supply functions for general equilibrium. Chapter III deals with estimation of consumption and supply functions of food-grains for India in Pre-Green Revolution period. Chapter IV deals with the estimation of consumption function of farmers of Haryana. Chapter V deals with the determinants of marketable surplus of Punjab: A case study of Sunher Village. Chapter VI deals with the estimation of supply functions of farmers of Haryana. Chapter VII concludes the main findings of the present study.

CHAPTER-I

REVIEW OF LITERATURE

Many under-developed countries of the world, particularly those that are making strenuous efforts to bring about rapid economic growth, are plagued by sharp fluctuations in prices in general, and food-grains prices in particular. Such sharp fluctuations in food-grains prices shatter their programmes of economic development and act as a constraint on smooth development. Inflation is, however, inseparably associated with the process of rapid development; in fact, it is the inevitable price that has to be paid for development (25). With a view to ensuring that inflationary pressures do not cross limits of tolerance and that price fluctuations are not too wild, it is necessary to watch carefully all parameters which affect prices in an economy. The factors that affect prices in developed countries may be different from those which affect them in developing countries. In fact, the problem of inflation may differ structurally from country to country. Therefore, detailed studies are needed for each country separately so as to formulate an appropriate price policy. Some studies(21,15,4)have addressed themselves to evaluate behaviour of prices in Indian economy. However, most of these studies have failed to go into the depth of the problem as a result of either the inadequacy of framework of anaylsis or inadequacy of data or inadequacy of methodology or all.

Consequently, they have not succeeded in striking at the roots of this problem. The objective of this study is to examine the problem of prices of food-grains and their determinants in a developing country like India, where most of the farmers live at the verge of subsistence.

An important feature of Indian economy is that food-grains constitute one of the largest sub-sector. In the mid-fifties food-grains accounted for 67 percent of Indian' agricultural production and 31 percent of the entire wholesale trade (42). In 1960-61 the share of food-grains in total agricultural output was 80.32 percent which increased to 81.77 percent in 1970-71 (32).

Naturally, prices of food-grains play the pivotal role in maintenance or disturbance of stability of general prices in Indian economy. In fact, it has been the unique experience of Indian economy that during periods when general prices have been tending to stabilise, changes in food-grain prices have sparked off a general inflationary process. This happened in 1953-54 and again in 1966-67 and then 1971-72 and 1978-79 (33). Food-grain prices are not only important from this view point but they are also important from farmers point of view. Farmers have to view these prices in their dual capacities of a consumer and as well as a producer. A high price for food-grain provides them an incentive to produce more while on the other hand their income increases by the same percentage by which the price changes, which enables them to produce more of their own produce. But for other consumers, these prices have only adverse effects. Therefore, it is important to have an appropriate and effective policy for food-grain prices for which an identification of factors responsible for fluctuations in food-grain prices is required. In the present context of rising prices, total production should not be considered as the effective determinant. It is amount of market arrivals rather than total products which should be considered as a determinant of prices because the portion of total output which is actually sold is responsible for the determination of prices.

CONCEPTS:

'Marketable surplus' represents total surplus which producers have a potential to provide to the market. This is the quantum that is likely to be left in their hands after meeting genuine requirements of consumption, payment of wages in kind, feed, seed, etc. This may, however, be distinguished from 'marketed surplus' which represents only that portion of the marketable surplus which is actually sold and is placed at the disposal of non-producers (2) .

For the poor farmers, marketed surplus may be larger than marketable surplus because they sell out of distress and have to repurchase later at higher prices.

The case is different with rich farmers who tend to keep some amount of their produce in the form of stocks. Thus, in their case, marketable surplus may be greater than marketed surplus.

According to Mathur-Ezekiel (25) which of these terms is more appropriate depends upon the nature of an economy. In developing countries, producers sell that amount of output which is sufficient to provide necessary cash and it is consumption which is treated as the residual. But in developed countries, producers treat their consumption requirement as essential while the sales are treated as a residual. Distinction between two other concepts of surplus is also essential. These concepts are those of gross and net marketed surplus. Gross refers to actually marketed quantities and net marketed surplus is the gross marketed surplus minus repurchases from the market (28).

Obviously, an overall (I) increase in agricultural productivity, in general, may not by itself be sufficient to sustain the tempo of development. What is far more crucial to the process of development is growth of marketed surplus as output grows. If marketed surplus does not increase with an increase in production, it may well constitute a fundamental bottleneck in rapid development. Growth of marketed surplus provides necessary funds for capital formation, may increase foreign exchange earnings if extra supplies are exported, and it tends to ease the problem of balance of payments by obviating necessity to import food-grains and raw-materials.

Review

Interest in marketable surplus is not new, at least in India. Many attempts have been made to know relationship between marketable surplus on the one hand, and output, prices and size of holding , on the other hand. However, in depth, studies in case of low income countries may provide some insights into other economic problems of the economy. Though individual studies may have a limited scope and may not be capable of illuminating all facets of the problem, yet through a review of literature, it may be possible to piece together scattered studies in such a manner as will enable us to view the problem in the widest perspective and its entirety. This not only shortens the gap between understanding but it also helps in an examination of different policy implications.

Agrarian structure is one of the factors that affect marketable surplus. Agrarian structure is mainly determined by land relations, which in their turn, get reflected in size distribution of holdings. Therefore, it is assumed that size of holding is an important determinant of marketed surplus. Behaviour of marketable surplus across various sizes of holding helps us in identifying the non-viable holdings in different regions.

A couple of studies have estimated relationship between size of holding and marketable surplus. While these studies agree that the marketed surplus is not an exclusive characteristic of only "large holdings, they differ on several other points of substance (8). These studies have been conducted in two different ways i.e. indirect and direct estimation. Dharm Narain and Utsa Patnaik have studied the problem in indirect manner- but both have come to dramatically opposite conclusions. Dharam Narain (29) for example, finds in his study that marketable surplus as a proportion of output declines as size of holding increases upto the size group 10 to 15 hectares, it rises thereafter with size of holding. He further finds that even land-holdings in the size-class 0-5 hectare sell to the market slightly more than one fifth of their total output. On the other hand, Mathur (24) shows that sale of jawar by land-holdings in the size class 0-5 acres is practically nil. This difference arises only due to the difference between the concepts of marketed and marketable surplus used in two studies. Besides, while Mathur deals exclusively with a single crop: Jowar which incidentally is the main diet of the poor and marginal farmers of the region of study, Dharm Narain covers all food-grains and the country as a whole.

Utsa Patnaik (31) concluded that small farmers accounted for smaller proportion of total sales to the market. Farmers having upto 10 acres of land accounted for 33.2 percent while farmers having upto 15 acres accounted for 44.4 percent of total marketable surplus. She did not find any perverse relation between marketable surplus and output and size of holding. Results of our study of Sunher village in Punjab are also in contra-distinction to those of Narain but are similar to those of Utsa Patnaik. Her results are also supported by results of All India Rural Debt and Investment Survey, 1961-62 by RBI(28) : In this case, behaviour of marketable surplus is fairly the same as has been found by Patnaik. But in both of these studies, they have admitted that the contribution of small farmers to marketable surplus seems to have been over-estimated due to two reasons. First, they have included the repurchased quantities and second, they have used the gross value of output of agriculture.

A study by Sharma(41) based on indirect estimation is both at national as well as at state levels. According to Sharma, proportion of marketable surplus to net production of food-grains increases consistently with an increase in size of holding. Thus, he has tried to eliminate one source of over estimation by considering net output in place of gross output into consideration. But second source of over estimation does not seem to be eliminated into this study as well.

A study of relationship between size of holding and marketable surplus (estimated directly) provides a more detailed picture at micro level. A study of Amritsar and Karnal districts by George and Singh (43) showed that Punjab farmers, even small ones, grow paddy mainly as a cash crop and satisfy consumption need by other crops. While small farmers treated paddy mainly as a cash crop, medium and big farmers treated it wholly as a cash crop. But in our study[35] as far as medium and large farmers are concerned, they with-hold 18 to 24 percent of their output of wheat and only 2 to 6 percent of output of paddy for their household consumption. Thus, paddy for these farmers is wholly a commercial crop but wheat is partially but largely a commercial crop. But in case of West Bengal, the picture is a little different. Hati[16] finds that for the farm size above 1.98 hectares, the proportion of marketable surplus rises at an increasing rate as farm size increases.

Distinguishing features of different studies are that some of these studies such as by Dharm Narain, Utsa Patnaik and RBI cover the country as a whole, While other studies are related to particular regions/ or districts of a state. This feature gives rise to another difference. Studies of Sharma, George, Chaudhary etc. relate to Punjab where wheat is a staple diet of the people. Naturally, farmers treat paddy as a cash crop just like sugar cane, cotton, etc. Studies by Nadkarni and Mathur relate to backward areas of Maharashtra where most farmers are not only marginal and poor but crops like jowar constitute their staple diet. Such food-grains crops as wheat and paddy are treated as cash crops by such farmers. Hatis' study relates to West Bengal where farmers are relatively poor and rice is the staple diet. Hence, other food-grains crops are treated as cash crops. Therefore, such factors may also account for some of the differences in their empirical findings.

With the help of the pictures presented by micro level studies, we can have a general idea about the relationship between size of holding and marketable surplus. First, proportion of marketable surplus and marketed surplus increases significantly as a the scale of farming increases. A great proportion of total marketable surplus is accounted by a small fraction of total farmers, usually they happen to be rich farmers. Second, some of the marginal farmers are not able to meet their consumption needs from their farm produce. Therefore, their contribution to total marketed surplus is negligible and, at times, it might even be negative. Finally, small farmers also produce commercial and even some superior cereals, and all such crops are treated as cash crops.

If indeed the proportion of marketable surplus increases significantly with the scale of production, then the income/output elasticity of consumption will play a decisive role in the determination of marketable surplus of farmers concerned.

Many economists have propounded the hypothesis that marketable surplus is closely related to prices; output/income. But here the crucial question is to know whether supply of marketable surplus is a positive function of prices and output/income; and whether the response of marketable surplus to a given change in price and income is negligible or substantial.

Mathur-Ezekiel(25)profounded the hypothesis that "the behaviour of food-grain prices is dependent not merely on total production of food-grains but also on the proportion of it which is marketed......[1]. In under-developed economies farmers sell that amount of output which will give them the amount of money needed to satisfy their cash-requirements and retain the balance of their output for their own consumption. Thus, it is due to the fixity of cash-requirement, prices are inversely related to marketable surplus.....

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1. For Empirical verification of this hypothesis, see Krishnan, Mathur and Prakash, Tripathi.

The subsistence farmers have inelastic demand for cash. If prices rise, the sale of a smaller amount of food-grains provides the necessary cash and vice-versa. This makes the short-run supply curve of food-grains backward bending. Krishnan (22) found empirical evidence in support of hypothesis of inverse relationship between price and marketed surplus while relaxing the assumption of fixity of cash-requirements. Even when cash-requirements grow either positively or negatively, marketable surplus has been found empirically to be inversely related to prices (44). Mathur and Prakash (27) accepted Krishnan's contention that inverse relation between marketed surplus and price is not contingent upon the fixity of cash requirements. However, they argue that the size of marketable surplus is decidedly affected by the level of cash-requirements and changes therein.

Dandekar has observed that a very small proportion of producers react inversely to prices. According to him, small producers at the bottom end of the scale have no surplus to sell and as such the question whether elasticity is positive or negative does not apply to them. So far as the large and prosperous farmers are concerned, they have normal positive elasticity. Therefore, negative elasticity would be applicable only to the intermediate size farms which are neither so small as to have no surplus to sell, nor so large as to show the positive response. Dandekar further argues that even for this intermediate category of farms the negative price elasticity is easily explainable as normal consumer behaviour and as such there is no need to make the fixed cash requirements assumption (9).

Dandekar's analysis is not however very persuasive (39). His argument in case of small farmers ignores the possibility of marketed surplus appearing in the face of a favourable price change which causes their self consumption to decline via a large substitution effect. Even at the empirical level, his analysis is far from conclusive as it is based on the sale and purchase data of a single crop viz. 'Jowar'.

Khatkhate (18) considers such behaviour to be paradoxical, but there is nothing paradoxical about their behaviour except that they belong to lower end of the income ladder where ordinarily food needs are not fully satisfied quantitatively.

Khatkhate (18) believes that rise in relative prices does not stimulate production in agricultural sector. He says that a small farmer strives to produce to the maximum extent that his farm capacity permits. But the inference that because he is already producing to maximum, rise in prices would not have any impact on his production, is difficult to swallow. Olson(9) tried to support his hypothesis and he argued that the failure to increase yield is not due to lack of price incentives but to the lack of credit, lack of knowledge and non-availability of fertilizers etc.. In brief, it is supply constraints that stultify growth of agricultural output.

In many of the studies, prices are not considered because studies are based on cross-section data which relates to a point of time. If in such studies, prices are taken, it will not have any impact. In one of the study by Vyas and Maharaja(28) output elasticity yields positive as well as high value. Another study by Khan and Chowdury (28)of West Pakistan and by Shah(28)of Gujarat based on cross-section data represented significant positive relationship between production and market supply. An elasticity greater than unity would suggest a more than proportionate response with a given change in output and provide a basis for designing a progressive structure for the procurement of marketable surplus.

Krishnan (22)has tried to test Mathur-Ezekiel hypothesis: Is marketed surplus of food-grains inversely related to prices? The crux of the problem is that supply of food-grains is fixed in short-run. Krishnan has tried to estimate elasticity of marketable surplus from demand function of food-grains with a given supply with the following expression:

$$\gamma \bar{Q} = A P^{-\alpha} (\bar{Q} P)^{\beta}$$

$$M = -(\beta - \alpha) \frac{\gamma}{1-\gamma}$$

where β and α are income and price elasticities respectively and γ is the proportion of output consumed by them. It is clear that the sign and magnitude of elasticity of marketable surplus is eventually determined by the sign and magnitudes of income and price elasticity. A farmer behaves in the market in dual capacity. An increase in prices affects him both as a producer and consumer of food-grains. A rise in prices will decrease his consumption of food-grains, while on the other hand, as a producer, it will increase his monetary as well as real income. So this increase in income compensates his loss as a consumer. So due to this reason, own consumption rises. In his thesis, price, income, elasticities of consumption and elasticity of marketable surplus are found to be -.3584, .5215 and -.3030 respectively which support the hypothesis of inverse relationship between price and marketable surplus and it is obvious that the hypothesis is operationally valid for Indian economy.

Further, this hypothesis was tested empirically by Tripathi (44). In her thesis, she argued that inverse relationship between price and marketable surplus implicitly assumes that marketable surplus should increase with cash requirement and vice-versa. It implies positive relationship between cash-requirement and marketable surplus. She further argued that if farmers have got inadequate demand due to low income and output, then an increase in output may lead to utilisation of additional quantities of food-grains to satisfy this pent-up demand rather than augmenting cash-requirements which in their turn would increase marketable surplus. Her study reveals that cash-requirements of all sixteen families studied have grown negatively, output has grown negatively only in case of five families. Thus, growth of output happens to be inversely related with the growth of cash-requirements. Positive growth of output of eleven families seem to have led the farmers to satisfy their reserved demand- for food-grains rather than augmenting their consumption of non-food items or productive investment. Thus, these results lend a very strong support to hypothesis of backward bending supply curve of food-grains postulated by Mathur-Ezekiel. Incidentally, these results are obtained, when cash-requirements instead of being fixed, have grown negatively or positively. Thus, postulated relationship between marketable surplus and prices could be obtained when cash-requirements are fixed as well as when they grow negatively or positively. Her empirical results support the hypothesis propounded by Krishnan that Mathur-Ezekiel theorem can be derived while relaxing the assumption of fixity of cash-requirements. But negative growth of cash-requirement does not seem to be plausible in the present situation of rising prices.

Vinod Dubey(10) criticises the hypothesis that an increase in agricultural production does not lead to an increase in marketable surplus due to fixity of cash-requirement. According to him, in under-developed countries, the structure of the economy is of dualistic nature. Traditional agricultural sector co-exists with modern industrial sector in the economy. An increase in per capita income in agricultural sector leads to increased demand for goods produced in non-agricultural sector. This is possible only through securing more cash by selling more. Secondly, if we take demonstration effect into consideration, then increased farmers' income will partially be spent on commodities other than food-grains because desired pattern of consumption differs significantly from actual pattern of consumption. So according to Dubey, an increase in production leads to an increase in marketed surplus.

But the type of relationship between two sectors which he had taken into account depends first, on the degree of inter-dependence between two sectors and secondly, on the price and income elasticities. What Dubey has discussed can be true only in case of highly developed economy. But in case of India, several empirical studies have revealed a low degree of inter-dependence between two sectors. One of the study revealed that inter-dependence between farm and non-farm sectors as revealed by backward and forward linkages is weaker than the degree of inter-dependence between manufacturing industries (23). Secondly a great mass of people are still under the subsistence level and spend a large part of their income on the food-grains. But price and income elasticities which are visualized by Dubey is probably possible at the advanced stage of development, ~~But~~ in the short-run this is not possible. This is supported by empirical results. Tripathi found in her study that in Punjab even the prosperous middle and large farmers in post-green revolution period have continued to treat food-grains as a superior good. So Dubey's criticism is invalid in this case. Thirdly, in a developing country like India, majority of people are occupied in subsistence farming and they are not able to meet their own consumption requirements. So in such a situation of near starvation, an increase in output, would not lead to increase in marketed surplus. But on the other hand, people would like to fulfill their wants which are suppressed over long periods.

A rational human being would normally respond to prices in the sense that an increase in prices could induce him to put more in the market for sale so as to earn maximum profits. This is true in the case of advanced economies where agriculture is more a business than a way of life. But in under-developed countries like India, the phenomenon of 'backward bending supply curve' operates. A rise in price, instead of being an incentive to sell more, the tendency on the part of cultivators is to sell less just to be liquid enough to meet their bare needs and vice-versa.

Raj Krishna [19] also prepared a model to estimate elasticity of marketable surplus for a subsistence crop and estimated the price elasticity of marketed surplus with the following expression:

$$e = \gamma b - (\gamma - 1) d \qquad \ldots (1)$$

where γ is the reciprocal of marketed surplus- output ratio, b is price elasticity of output, and d is the price elasticity of farm consumption. He concluded in his study that so long as the price elasticity of output is positive, price elasticity of marketed surplus should also be positive and greater than price elasticity of output. Krishna preferred cross-section study but in such studies elasticities estimated are almost non-significant.(20) In cross-section analysis, the object is to identify and measure the effect of the other factors which determine how much of the output of a subsistence crop will be taken to the market by different peasant families in a poor, partially commercialised economy while in time series data interest is focused on the response of the marketed supply to price movements.

.ain pitfall of his model is that only cash income instead of total net income of the peasants is taken into consideration. Secondly, he has implicitly assumed complete adjustment which means that his elasticity may be relevant only to a substantial number of production periods after a change in price. Finally, he used relative price rather than absolute prices for estimating elasticities of marketed surplus with respect to price and output. He has not taken into consideration changes in food-grains prices because time-series data are not available. It needs a stout heart to make a general policy pronouncement without taking into consideration the effect of an important variable such as price on which the quantum of marketable surplus has been hypothesized and observed to depend. Inflationary rise in prices, on the one hand, raises the money and real income of the farmer because they can meet their money needs by selling a small part of their produce and on the other hand, encourages them to hold back a greater part of the produce from the market in expectation of getting a more favourable price in the future. So under the circumstances, the applicability of the findings of Raj Krishna's study for the country as a whole is questionable and the policy prescription advanced by him is of doubtful validity, it is more so in view of empirical results thrown up by recent studies.

Krishna's model has received considerable attention and has prompted several empirical investigations of marketed surplus. Toquero et al (28) has adopted this technique in the study of rice in two regions of Philippines.

Their study revealed positive value of both partial and total price elasticities- partial elasticities are low and relative price turns out to be non-significant and simultaneously the estimated elasticity of marketable surplus with respect to output turns out to be higher than one as well as larger than partial and total price elasticities.

Behrman (7) also developed his model in order to derive the elasticities. The final expression in his model to derive elasticities was different from that of Raj Krishna:

$$e = \gamma b_1 - (\gamma - 1)\ (g+hK)(1+b_1)\ -\ (\gamma - 1)\ h\ b_2 (1+K).$$

Elasticity could be derived in terms of parameters of the above equation, which can be estimated directly from the data. The elasticity estimated from the equation comes out to be negative for wheat in case of Punjab at lower level of sales ratio, though at higher levels, it yields positive elasticities. In his model, the demand for on farm consumption is made to be a function of the total net income of the peasant unit. It seems to be more reasonable assumption than Krishna's model. Moreover, elasticity of output in Behrman's model is a function of the number of production periods which elapse after the change in price whereas Krishna does not bring in the time factor which is too important for determining the elasticities.

Bardhan(3,4) also conducted a study of cross-section data of a village level. Bardhan regressed percent of food-grains marketed on total supply of food-grains, price of food-grains and several other variables using OLS method. Her results showed that cross-sectional price elasticity of marketed surplus though still negative, is smaller in magnitude and statistically less significant than in the case of general sample. In her model, she has taken prices to be exogenously given. But criticising her model, Hassel(15) commented that village prices are not exogenous as they are determined by marketed surplus. Using her data, he himself developed a model and found positive short-run price elasticity of marketable surplus which ranged from 2.7 to 3 for larger farmers and output elasticity is greater than unity and statistically significant(1.97, 1.75) In his model, marketable surplus is treated as residual. He concluded on the basis of empirical result that the farmers respond to changes in prices and income as consumer and higher prices will result in sales of larger quantities. But his argument is invalid on the basis of the assumption of closed and self-sufficient village.

At the same time, Shah and Pandey (28) carried a study of sales of wheat by farm households. They treated family size, output, sale price of wheat and price of a major substitute of wheat as independent variables.

Both family size and output led the expected negative and positive coefficients respectively and statistically significant.

All the studies were at micro level but on the other hand macro level studies provided an opportunity to study inter-relationship between agricultural and non-agricultural sector based on indirect estimates from time-series. Bardhan and Bardhan (5) tried to derive the time series of marketed surplus of cereals with national level data. They obtained a positive and also a unitary elasticity of marketed supply with respect to ratio of cereal price to the prices of other food-products but negative elasticity with respect to price ratio between commercial crops and cereals. Thamarajakshi (28)also indirectly derived time-series estimates of marketed surplus for the years 1951 to 1965. The coefficients with respect to output were both positive and statistically significant. The output elasticity (.44) which was found to be less than unity. Similarly, Venkataramanan and Prahladchar (28) carried out the study for the period of 1964 to 1973 by the same methodology. His study revealed that a significantly high output elasticity of marketable surplus observed from cross section data does not seem to be applicable to time-series data. Comparative study of two periods indicate that the degree of inter-dependence of two sectors has increased and agriculture has been more commercialised.

Nadkarni(28) also attempted to prove the already postulated hypothesis relating to marketable surplus and price; output and income. The questions of marketed and marketable surplus, on the one hand, and extent of purchases from market for consumption, on the other hand, are considered to be the counter parts of the larger issue of commercialisation. He had tried to show that how different classes of farmers participate in the process of commercialisation within the limitation of data. His study is related with to a region which is characterised by the dominance of millets; Jawar constitutes the staple diet of the people- wheat is considered as a cash crop. The period under study is 1969-71 and average of three years data is taken. As a study is at a point of time, so there is no question of studying the responsiveness of marketable surplus to prices. His study reveals negative net marketed and marketable surplus of both jawar and bajra in the smallest two or three size classes. But it is only in case of all-size classes, Inspite of above results, marketable surplus of wheat is concentrated among the large size classes. Analysis of marketed and marketable surplus are made through log-linear regression equation. In general, however, we find both the response co-efficient with respect to output and elasticity higher and significant for the house-holds above demarcation than for those below demarcation. Other things being given, market response to output in case of every crop is positive and significant whether it is superior or inferior. Estimated elasticities in case of all the three commodities, elasticity of marketable surplus of wheat is greater i.e. 0.94 while the elasticity in case of jawar and bajra is 0.63 to 0.80 and .29 to .75 respectively. This indicates that people consider wheat as cash crop while depend on jawar and bajra for their consumption needs.

In case of income as independent variable- elasticity was negative for the households below demarcation and positive above demarcation households. Negative value implies that these households make repurchases of staple food-grains when their income increases. The concentration of marketable surplus in the hands of big farmers gives them an unequal advantage in the labour market as well.

This is a study of a particular district i.e. Ahmednagar district, which is characterized by dominance of small millets. This district is confronted with irrigation problems. The study of this type can be a good guide from the regional planning point of view. The estimated results can provide a wider prospective to understand the problems and situation which is prevailing in such regions. If state government is interested for improvement, for planning purposes, this study is going to be of great help. This can easily represent the areas which are un-irrigated or where the irrigation facilities are low. Even for the planning at district level, it will be quite useful. But such type of regional studies, can not be taken as the representative of the whole state or country. In this study, prices are left out of investigation. We are not belittling the importance of this study but as study is based on cross - sectional analysis so it is related only to a point of time. So prices at a point of time can not be significantly different for different households. If we take the study as it is then its usefulness is limited. If prices were also taken then it would have been much more important from view point of policy.

Briefly, on the whole, marketable surplus should be analysed in the wider perspective of the quality and the extent of commercialisation and development of the home market in its various dimensions. The question has a great relevance for the prospects of India's economic development. Academic attention should now be focused more on socially and economically relevant issues such as the question of price responsiveness of marketable surplus.

CHAPTER-II

MATHEMATICAL MODEL

In this chapter an attempt is made to derive the demand function for a two commodity model. Generally, a rational consumer wants to maximise his utility. Let us assume that there are two commodities and let their quantities be q_1 and q_2 respectively. Hence, the budget constraint will be

$$Y^\circ = P_1q_1 + P_2q_2 \qquad \ldots(1)$$

P_1 and P_2 are the prices respectively.

Y° = amount of fixed income.

In such a situation utility function is:

$U = f\ (q_1,\ q_2) \qquad \ldots.(2)$ subject to budget constraint. So the lagrangian function will be:

$$L = f\ (q_1, q_2) + \lambda(Y^\circ - P_1q_1 - P_2q_2) \qquad \ldots(3)$$

Condition:

(1) According to first order condition, all the first order partial derivatives are zero. Now differentiating equation (3) with respect to q_1, q_2 and λ we get:

(a) $\dfrac{\partial L}{\partial q_1} = \dfrac{\partial f}{\partial q_1} - \lambda P_1 = f_1 - \lambda P_1 = 0$ or $f_1 = \lambda P_1 \quad \ldots(4)$

(b) $\frac{\partial L}{\partial q_2} = \frac{\partial f}{\partial q_2} - \lambda P_2 = f_2 - \lambda P_2 = 0;\ f_2 = \lambda P_2$ ---(5)

(c) $\frac{\partial L}{\partial \lambda} = Y^0 - P_1 q_1 - P_2 q_2 = 0$ .... (6)

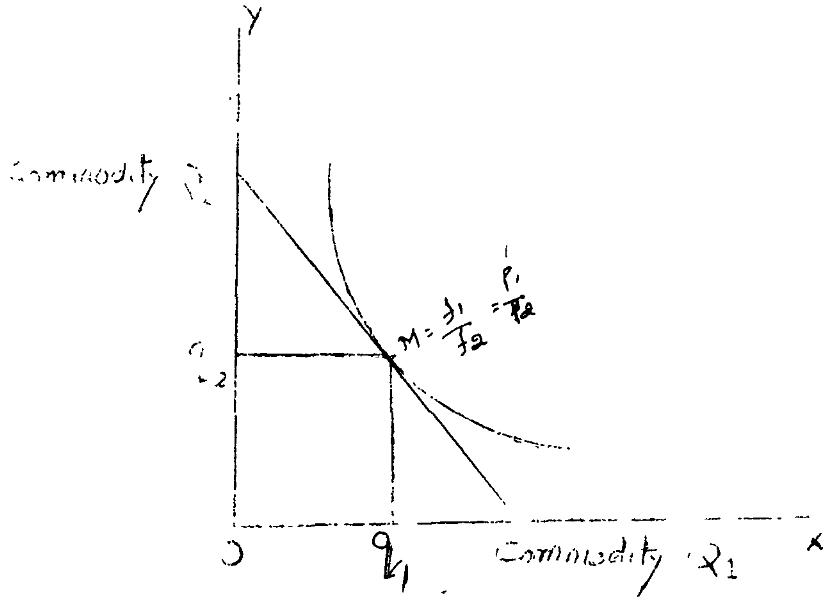
Solution of these equations will give us the point at which the utility would either be maximum or minimum.

$$\frac{f_1}{P_1} = \frac{f_2}{P_2} = \lambda;\quad f_1 = \text{marginal utility of } q_1$$

$$\frac{M.U_1}{P_1} = \frac{M.U_2}{P_2} = \lambda \qquad \ldots(7)$$

Thus, the consumer, in order to maximise the utility, must allocate his income so as to equalize the ratio of marginal utility to the price of each commodity. These ratios must also be equal to the M.U. of money which is represented by λ, while f_1/f_2 represents the slope of indifference curve and P_1/P_2 represents the slope of the budget line. Another proposition which comes out from this analysis is that equilibrium will be at the point where slope of indifference curve is equal to the slope of price line. Fig. 1 below makes it clear

(Figure on next page, please)



II. <u>Second Order Condition:</u>

Second order condition for maximising the utility is that the relevant bordered Hessian determinant should be positive.

$$|H| = \begin{vmatrix} 0 & -P_1 & -P_2 \\ -P_1 & f_{11} & f_{12} \\ -P_2 & f_{21} & f_{22} \end{vmatrix} > 0$$

$$- P_1^2 f_{22} + 2 P_1 P_2 f_{12} + P_2^2 f_{11} > 0$$

This matrix is bordered by the prices of two goods. From (4), (5) and (6), we will get

$$\frac{\partial^2 L}{\partial q_1^2} = f_{11} \qquad \ldots(8)$$

$$\frac{\partial^2 L}{\partial q_2^2} = f_{22} \qquad \ldots(9)$$

$$\frac{\partial}{\partial q_2} \cdot \frac{\partial L}{\partial q_1} = f_{12} \qquad \ldots(10)$$

$$\frac{\partial}{\partial q_1} \cdot \frac{\partial L}{\partial q_2} = f_{21} \qquad \ldots(11)$$

Thus, two properties of the demand equation are clear: the demand function is single valued function of income and prices. Second, the demand functions are homogeneous of degree zero which means that when income and prices change in the same proportion and in the same direction, then demand for the commodity remains constant.

Price-elasticity:

Price elasticity is nothing but a proportionate change in demand/proportionate change in price. The elasticity is negative if the corresponding demand curve is downward sloping.

$$\varepsilon_{11} = \frac{\text{Change in demand/Total demand}}{\text{Change in Price/Total price}}$$

ε_{11} = Price elasticity.

Cross elasticity:

It is the ratio of proportionate change in quantity of one commodity to the proportionate change in the price of the other commodity:

$$\varepsilon_{21} = \frac{P_1}{q_2} \left(\frac{\partial q_2}{\partial P_1} \right)$$

ε_{21} = Cross price elasticity. Whether these elasticities are positive or negative depends upon the type of the commodity consumed.

Taking the total differential of the budget constraint (1) and putting $dy° = dP_2 = 0$, we get

$$dy° = P_1 \, d\, q_1 + q_1 \, d\, P_1 + P_2 \, d\, q_2 = 0 \qquad \ldots(12)$$

If we multiply the equation (12) by $(P_1 \, q_1 \, q_2 \, / \, y° \, q_1 \, q_2 \, d\, P_1)$ then the equation will be

$$= (P_1 dq_1)\left(\frac{P_1 q_1 q_2}{y° q_1 q_2 dP_1}\right) + (q_1 dP_1)\left(\frac{P_1 q_1 q_2}{y° q_1 q_2 dP_1}\right) + (P_2 dq_2)\left(\frac{P_1 q_1 q_2}{y° q_1 q_2 dP_1}\right) \quad \text{---- (13)}$$

$$= \left(\frac{P_1 dq_1}{q_1 dP_1}\right)\left(\frac{P_1 q_1 q_2}{y° q_2}\right) + \left(\frac{\cancel{q_1 dP_1}}{\cancel{q_1 dP_1}}\right)\left(\frac{P_1 q_1 q_2}{y° q_2}\right) + \left(\frac{P_2 dq_2}{q_2 dP_1}\right)\left(\frac{P_2 q_1 q_2}{y° q_2}\right) \text{-- (14)}$$

$$= \varepsilon_{11}\alpha_1 + \varepsilon_{21}\alpha_2 + \alpha_1 = 0$$

$$= \varepsilon_{11}\alpha_1 + \varepsilon_{21}\alpha_2 = -\alpha_1 \qquad (15)$$

(a) $\dfrac{P_1 \, dq_1}{q_1 \, dP_1}$ = Own price elasticity

(b) $\dfrac{P_1\, dq_2}{q_2\, dP_1}$ = Cross price elasticity

(c) $\dfrac{P_1 q_1}{y^0} = \alpha_1$

The equation (15) tells us about the cross elasticity, when own price elasticity is given.

Income Elasticity:

Income elasticity is defined as the proportionate change in purchases of a commodity relative to the proportionate change in income with prices remaining constant

$$\eta_1 = \frac{y}{q_1} \times \frac{\partial q_1}{\partial y} \qquad \ldots \quad \ldots \quad \ldots (16)$$

Income elasticity can be negative, positive or zero but normally it is assumed to be positive.

Substitution and Income effects:

Comparative static analysis examines the effect of disturbances in exogenous variables on the solution values for the endogenous variables in order to find out the magnitude of the effect of prices and income on the consumer purchases if we allow all the variables to vary simultaneously, then situation will be different.

When all the variables are changing simultaneously then total differentiation of these following equation will be

$$U = f\ (q_1, q_2)$$

$$L = f\ (q_1, q_2) + \lambda (y^\circ - P_1 q_1 - P_2 q_2)$$

First order conditions are:

(a) $\frac{\partial L}{\partial q_1} = f_1 - \lambda P_1 = 0$

(b) $\frac{\partial L}{\partial q_2} = f_2 - \lambda P_2 = 0$

(c) $\frac{\partial L}{\partial \lambda} = y^\circ - P_1 q_1 - P_2 q_2 = 0$

Second Order Condition:

Taking the total differential of above equations the new will be:

$$d\ (d\ Z) = d\ (fx\ dx) + d\ (fy\ dy) \qquad \ldots (17)$$

(a) $f_{11}\, dq_1 + f_{12}\, dq_2 - P_1\, d\lambda - \lambda\, d P_1 = 0$

(b) $f_{21}\, dq_1 + f_{22}\, dq_2 - P_2\, d\lambda - \lambda\, dP_2 = 0$

(c) $dy - P_1\, dq_1 - P_2\, dq_2 - q_1\, d P_1 - q_2\, dP_2 = 0$

or

$$f_{11}\, dq_1 + f_{12}\, dq_2 - P_1\, d\lambda = \lambda d P_1$$

$$f_{21}\, dq_1 + f_{22}\, dq_2 - P_2\, d\lambda \qquad = \lambda d\, P_2$$

$$-P_1\, dq_1 - P_2\, dq_2 = -dy + q_1\, dP_1 + q_2\, dP_2$$

In the matrix form

$$\begin{bmatrix} f_{11} & f_{12} & -P_1 \\ f_{21} & f_{22} & -P_2 \\ -P_1 & -P_2 & 0 \end{bmatrix} \begin{bmatrix} dq_1 \\ dq_2 \\ d\lambda \end{bmatrix} = \begin{bmatrix} \lambda d\, P_1 \\ \lambda d\, P_2 \\ -dy+q_1 dP_1+q_2 dP_2 \end{bmatrix}$$

But we want to find out the value of $d\,q_1$, dq_2 and $d\lambda$. Rewriting the above matrices:

$$\begin{bmatrix} dq_1 \\ dq_2 \\ d\lambda \end{bmatrix} = \begin{bmatrix} f_{11} & f_{12} & -P_1 \\ f_{21} & f_{22} & -P_2 \\ -P_1 & -P_2 & 0 \end{bmatrix}^{-1} \begin{bmatrix} \lambda dP_1 \\ \lambda dP_2 \\ -dy+q_1 dP_1+q_2 dP_2 \end{bmatrix}$$

If we put the whole inverse matrix equal to $(D)^{-1}$ then

$$= [D]^{-1} \begin{bmatrix} \lambda d\, P_1 \\ \lambda d\, P_2 \\ -dy + q_1\, dP_1 + q_2\, dP_2 \end{bmatrix} \qquad \ldots (18)$$

$[D]^{-1} = \frac{1}{|D|}$ (co-factors of the matrix)

$$= \frac{1}{|D|} \begin{vmatrix} D_{11} & D_{21} & D_{31} \\ D_{12} & D_{22} & D_{32} \\ D_{13} & D_{23} & D_{33} \end{vmatrix} \begin{bmatrix} \lambda d P_1 \\ \lambda d P_2 \\ -dy+q_1 dP_1+q_2 dP_2 \end{bmatrix}$$

whereas $D_{11} = \begin{vmatrix} f_{22} & -P_2 \\ -P_2 & 0 \end{vmatrix}$

So the values of dq_1, dq_2 and $d\lambda$ will be

(1) $dq_1 = \dfrac{\lambda D_{11}\, dP_1 + \lambda D_{21}\, dP_2 + D_{31}\, (-dy+q_1\, dP_1+q_2 dP_2)}{D}$

(2) $dq_2 = \dfrac{\lambda D_{12} dP_1 + \lambda D_{22} dP_2 + D_{32}\, (-dy+q_1 dP_1+q_2 dP_2)}{D}$

(3) $d\lambda = \dfrac{\lambda D_3 dP_1 + \lambda D_{23}\, dP_2 + D_{33}\, (-dy+q_1 dP_1+q_2 dP_2)}{D}$

If we put $dy° = dP_2 = 0$ and divide the both sides of the above equations by dp_1

(a) $\dfrac{dq_1}{dP_1} = \dfrac{\lambda D_{11}\, dP_1 + \lambda D_{21} dP_2 + D_{31} (-dy+q_1 dP_1+q_2 dP_2)}{(D)\ (d\, P_1)}$ ...(19)

(A) $\dfrac{\partial q_1}{\partial P_1} = \dfrac{\lambda D_{11}}{D} + q_1 \dfrac{D_{31}}{D}$ ...(20)

where $\dfrac{\partial q_1}{\partial P_1}$ is the rate of change of consumer's purchases of Q_1 with respect to change in P_1 while other things being equal. If we divide it by dy, the rate of change with respect to income will be

$$(R) \quad \frac{\partial q_1}{\partial y} = -\frac{D_{31}}{D} \qquad ..(21)$$

Change in the prices of the commodities will lead to the different level of equilibrium. If change in prices is accompanied by a change in income, then consumer's satisfaction will be at the same level so that d u = 0.

Mathur-Ezekiel propounded the hypothesis that short-run supply of food-grains tends to be backward bending. With the help of a mathematical model, we try to present the main argument (26) [27] [33]

If food-grain sector, Ω_f denotes the total per capita output of the food-grains producers. This Ω_f ~~is~~ consists of different items, as

$$\Omega_{f_t} = O_{ft} + N_{ft} \pm (S_{f_t} - S_{ft-1}) \qquad ...(22)$$

whereas Ω_{ft} is total available quantity of the good in period t; O_{ft} is total output in year t; N_{ft} is purchased from outside and $(S_{ft} - S_{ft-1})$ is the changes in stocks of goods.

A producer, being a consumer also wants to maximise his utility while allocating this available output among different uses as human consumption, seeds, cattle feed and sales to the market. D_{ft} represents his total demand as follows:

$$D_{ft} = C_{ft} + F_{ft} + Z_{ft} + \bar{M}_{ft} \qquad \ldots(23)$$

where C_{ft} is total human consumption, F_{ft} cattle feed, Z_{ft} = seed requirements, $\bar{M}_{ft}$ = Marketed surplus. For a general equilibrium the equality between the two equations is essential. For equilibrium

$$Q_{ft} = D_{ft} \qquad \ldots(24)$$

$$O_{ft}+N_{ft} \pm(S_{ft}-S_{ft-1}) = C_{ft}+F_{ft}+Z_{ft}+\bar{M}_{ft} \qquad \ldots(25)$$

so

$$M_{ft} = \bar{M}_{ft} \pm (S_{ft} - S_{ft-1})$$

$$= O_{ft} + N_{ft} - C_{ft} - F_{ft} - Z_{ft} \qquad \ldots(26)$$

So with a given output, Q_f, if we have got price index, then income of the producer will be

$$Y = P_f \, Q_f \qquad \ldots(27)$$

and marketable surplus will be

$$M = n \; (Q_1 - q_1) \qquad \ldots(28)$$

n = number of food-grain producers. With a given budget constraint, from the demand analysis, we get the following demand equation:

$$dq_1 = \lambda D_{11}dP_1 + \lambda D_{21}dP_2 + D_{31}(-dy+q_1dP_1+q_2dP_2) \qquad \ldots(29)$$

As dP_2 is zero and $dy = dP_1 \dfrac{(nq_1 + \bar{n}\bar{q}_1)}{n}$ then demand equation will be

$$dq_1 = (\lambda D_{11} + q_1 D_{31})dP_1 - \frac{nq_1 + \bar{n}\bar{q}_1}{n} D_{31}\, dP_1 \qquad \ldots(30)$$

This becomes

$$\frac{P_1}{q_1}\cdot\frac{dq_1}{dP_1} = \frac{P_1}{q_1}\cdot\frac{\partial q_1}{\partial P_1} + \frac{y}{q_1}\cdot\frac{\partial q_1}{\partial y} \qquad \ldots(31)$$

Total short-run elasticity of q_1 with respect to $P_1 = (\beta - \alpha)$. If we assume constant elasticity demand function, we can write

$$q_f = A P_f^{-\alpha} y_f^{\beta} \qquad (32)$$

where α and β are price and income elasticities respectively. Substituting these values in the equation (28) of marketable surplus, we will get another equation:

$$M = n\,(O_f - AP_f^{-\alpha}\; Y_f^{\beta})$$

or

$$M = n\,(O_f - AP_f^{(\beta-\alpha)}\; O_f^{\beta})$$

Thus, the partial elasticity of marketable surplus with price is given by

$$\frac{P_f}{M}\cdot\frac{\partial M}{\partial P_f} = \frac{P_f N_f}{M}\left(-(\beta-\alpha)\, AP_f^{(\beta-\alpha)} Q_f^{\beta}\right)$$

$$= -(\beta-\alpha)\frac{q_f}{O_f - q_f} \qquad \ldots\ldots (33)$$

If $Q_f > q_f$, the sign of the elasticity of the marketable surplus will be that of $-(\beta - \alpha)$. For a superior good, income elastitity is always greater than the own price elasticity; i.e. $\beta > \alpha$, gives the sign of the elasticity of marketable surplus with respect to price. This implies that the increase in prices of food-grain should reduce the marketable surplus. Thus, the inverse relationship between price and marketable surplus postulated in Mathur-Ezekiel study can be derived independent of any assumption about the farmers monetary requirements. However, the extent will be affected (27).

Marketed Surplus in the Short-run:

Marketed surplus is equal to marketable surplus minus stocks. If we deduce stocks from marketable surplus, we will have the equation for marketed surplus.

$$\bar{M} = M - S = n(O_f - q_f - S) \qquad \ldots$$

where S is per capita stock of food-grains and $\bar{M}$ is per capita marketed surplus.

$$\frac{P_1}{\bar{M}} \cdot \frac{d\bar{M}}{dP_1} = \frac{P_1}{\bar{M}} \cdot \frac{M}{M} \cdot \frac{dM}{dP_1} - \frac{P_1}{\bar{M}} \cdot \frac{S}{S} \cdot \frac{dS}{dP_1} \qquad \text{---(34)}$$

$$= \frac{M}{\bar{M}} \cdot \frac{P_1}{M} \cdot \frac{dM}{dP_1} - \frac{P_1}{\bar{M}} \cdot \frac{S}{S} \cdot \frac{dS}{dP_1} \qquad \text{---(35)}$$

Substituting the value of $\left(\frac{P_1}{M}\cdot\frac{dM}{dP_1}\right)$ we will get

$$= \frac{M}{\bar{M}}\cdot -(\beta-\alpha)\frac{q_f}{O_f-q_f} - \frac{S}{\bar{M}}\cdot\frac{\eta P_1}{\eta S}\cdot\frac{dS}{dP_1} \quad \text{---- (36)}$$

$$= -\frac{M}{\bar{M}}(\beta-\alpha)\frac{q_f}{O_f-q_f} - \frac{S}{\bar{M}}\cdot\frac{P_1}{S}\cdot\frac{dS}{dP_1} \quad \text{----- (37)}$$

Elasticity of marketed surplus is equal to $M/\bar{M}$ times elasticity of marketable surplus minus $S/\bar{M}$ times elasticity of stocks with respect to price. As $M > \bar{M}$ the first term itself makes elasticity of marketed surplus usually more negative than that of marketable surplus. In the subsequent chapters, we have made an attempt to estimate demand function, and marketable surplus for food-grains for Haryana farmers.

CHAPTER-III

CONSUMPTION AND SUPPLY FUNCTIONS IN PRE-GREEN REVOLUTION PERIOD

Oil crisis of early seventies has put prices in the fore-front of all problems that world economy faces today. Sudden and sharp spurt in prices, both in developing and developed countries, has become a regular feature since then. Price instability not only distorts structure of an economy, it also obstructs economic development. Consequently, price stability has become the foremost objective of present day economic policy. However, the gensis of inflation in developing countries is structurally different from that in the developed world. In developing countries like India, inflationary pressure not only emantes from agriculture but it also percolates therefrom to other sectors of the national economy. It is, therefore, these prices play a pivotal role in such economies. This is particularly true about food-grain prices (33) .

A sizeable proportion of output of food-grains does not pass through normal market channels. It is because producers themselves consume substantial proportion of their output and a change in prices of food-grains change their income proportionately. This makes positive income elasticity of their demand for food-grains larger than the negative price elasticity.

Consequently, whereas short-run supply curve of food-grains tends to be backward bending, their consumption curves happen to be positively sloped. This makes estimation of marketable surplus an intractable problem. Difficulties arise from the fact that the supply curve can not be estimated independently of consumption curve For this, if however, one has estimates of income and price elasticities of consumption, elasticity of marketable surplus could be derived (27) . As a matter of fact, changes in stocks affect balance equations of general equilibrium system directly. Therefore, an equality between demand and output alone is not sufficient for equilibrium which requires a balance between consumption, on the one hand, and changes in stocks and marketed surplus, on the other hand. Contrary to usual assumption of inventory behaviour, in a developing country, farmers tend to increase their stocks in response to rising prices of food-grains. This, in its turn, further aggravates scarcity of such goods when prices tend to move upward (33). Hence, estimation of farmers' propensity to consume and sell food-grains in different price and income situations can explain the mechanics of changes in prices of food-grains (27).

In this chapter, attempt has been made to estimate the determinant of consumption behaviour of farmers with All India data.

A few attempts have been made earlier to estimate consumption elasticity of food-grains, but these attempts remained confined to the derivation of engel elasticity from cross-section data. Naturally, estimates of price elasticity could not be had from these studies. First ever attempt to estimate price elasticity was made by Krishnan (21). However, his results were derived from N.S.S. data of 1951 to 1959. Radhakrishna (38) attempted to update these estimates but his study is based on few rounds of N.S.S. in 1961-62. The latest attempt in this direction has been made by Tripathi (44) but her data relate to state of Punjab. Hence, in our attempt, we have tried to update estimates of price and income elasticities of consumption of food-grains so as to examine if there has been a significant change in the values of these parameters during the post-green revolution period which is characterised by the introduction of high yielding varieties of seeds, the use of heavy doses of fertilizers and the use of cultural practices. It is expected that farmers' behaviour with respect to consumption, stocks and sales will be different in this period. Hence, a true assessment of the behaviour of (Haryana) farmers both qualitatively and quantitatively is done. Firstly, we have examined the behaviour of farmers ~~on~~ from N.S.S. data. Behaviour of Haryana farmers will be discussed in the succeeding chapters.

DATA SOURCE:

Data have been taken from N.S.S. reports on rural consumption in the light of above considerations. We have included all rounds from 1951 to 1965. These reports contain information about consumption of all rural people.

The N.S.S. is a repetitive, multi-purpose socio-economic enquiry carrying out about two rounds of survey each year since 1950. Collection of information in the NSS and the subsequent tabulation are done for two independent and inter-penetrating sub-samples. The reports provide data for each sub-sample as well as a combined estimate of the two sub-samples. In the following analysis of the N.S.S. data only the combined estimate is utilised.

The NSS reports furnish the details of consumer expenditure for twelve monthly per capita expenditure classes, namely, Rs 0-8, 8-11, 11-13, 13-15, 15-18, 18-21, 21-24, 24-28, 28-34, 34-43, 43-55 Rs. 55 and above. Though consumption data are is collected both in physical as well as in value terms but only value figures are published in the reports.

The sample includes persons belonging to all occupation/income groups. Naturally, all of them are not farmers. Besides, all farmers do not reside in villages, of necessity. In order to adjust data for inaccuracy of first type, Radhakrishna, in his attempt divided sample population into five income groups. He assumed that these income groups correspond to different occupation/social classes. Estimates of income and price elasticities have been derived for each income group separately. To the extent to which assumption on which this classification is based are approximate, estimates are likely to be affected by errors in this case as well. Even there is no guarantee that pattern of income distribution in a particular group represents true distribution in parent population. Even though income and occupation are greatly inter-related, it is not true that a particular range of income is uniquely identifiable with a specified occupation. So we have not attempted such a division in our study on the basis of such rough assumptions regarding level and pattern of income distribution among farmers. Obviously, choice is between erring on this side rather than that.

Methods and Assumptions:

As we have earlier noted that NSS reports provide data only in the form of value figures, so we have converted expenditure on food-grains in current prices into expenditure on food-grains in constant prices. 1952-53 has been taken as base year. This base has been selected with a view to maintain comparability of results with those of Krishnan (21) . Expenditure on food-grains in current prices has been deflated by the indices of food-grain prices. Similarly, total expenditure has been deflated by general price index.

Total expenditure has been used as a proxy for income because there is no information about it. On a priori reasoning, expenditure is considered as a better variable than income as a determinant of consumption because (i) errors in measurement of expenditure are likely to be much less than errors in measurement of income, (ii) total expenditure, particularly in rural areas, tends to show a much smaller degree of variation than income between years of poor and bumper harvests; and (iii) it is as if expenditure is a proxy of permanent income. [44] However, expenditure elasticity obtained from cross-section sample generally tends to be greater than income elasticity. Incidently, we have not derived the elasticities from cross-section data. Therefore, this is not likely to be the case in our results. We have estimated the price and expenditure elasticities from data for all groups combined together. These data are, in fact, weighted averages of expenditure incurred by each of twelve expenditure classes. In the second set, we have derived the estimates from panel data. Time-series and cross-section data have been combined together. For the time-series model, structure is assumed to remain constant throughout the whole period of observation. In aggregate consumption functions, it is also assumed that all micro level regression coefficients are constant and equal for individual income groups.

Empirical Results:

In our study, we have preferred log linear function to other functional forms because it relates proportionate change in dependent variable to proportionate change in pre-determined variable(s). Therefore, parameters of this relation yield direct estimates of elasticities. This equation has been estimated by OLS method. Equation estimated from weighted averages is given below:

1. $$\text{Log } C = .1045 - .1076^{*}\log P_1 + .0045 \log P_2 + .7958^{*}\log E$$

SE (.0318) (.0309) (.0611)

$R^2 = .3611^{*}$

2. $$\text{Log } C = .6421 - .1042^{*} \log P_1 + .7927^{*}\log E$$

SE (.0265) (.0524)

$R^2 = .3577^{*}$

In the first ~~above~~ equation, consumption of foodgrains has been treated as a function of own prices, prices of all other goods and total expenditure. But in the second equation, prices of other goods is dropped as an explanatory variable. Co-efficient of multiple determination is statistically significant. Own price and expenditure elasticities have got expected signs and are statistically significant. Though cross price elasticity of demand for food-grains is positive yet it is statistically non-significant. Positive sign of this elasticity is an indication of the fact that food-grains are treated as substitute of all other commodities such as clothing, education etc.. This can be true only for an economy which provides a measely level of living. However, its statistical non-significance reveals that this variable does not explain much of the changes in consumption. Radhakrishna (38) also got the similar results. Thus, this variable could be dropped from the equation without affecting the results significantly.

b) Another feature of these results is that total expenditure exerts a much greater degree of influence than price. Positive expenditure elasticity is nearly seven times larger than negative price elasticity which makes consumption curve positively sloped.

c) Removal of other prices from the equation does not affect either the sign or statistical significance of the price and expenditure elasticities. Relative dimension and numerical magnitude of the two elasticities do not change much. The co-efficient of multiple determination does not decrease much as a result of removal of this variable. This shows that prices of other goods are statistically superfluous explanatory variable so far as consumption of food-grains is concerned.

Elasticities estimated from weighted averages are not comparable to Krishnan's estimates, as he had derived estimates of elasticities from panel data. In view of the superfluousness of prices of other goods as an explanatory variable, ~~in~~ from the pooled data, only expenditure and own price elasticities have been estimated. The estimated equation from the panel data is given below:

$$\text{Log } C = -.2576 - .2528^{*} \log P_1 + .533^{*} \log E$$

$$\text{SE} \qquad (.0018) \qquad (.00008)$$

$$R^2 = .9129^{*}$$

Thus, we find that with an increase in observations, the fit of the equation has improved considerably. The level of confidence in parameters of this relation is much greater than the confidence level associated with earlier equation. Difference between positive expenditure and negative price elasticity is reduced considerably. In fact, expenditure elasticity is approximately twice as large as price elasticity. Thus, in pooled data estimates and the signs are as expected and consumption curve is again found to be positively sloped.

As this is a multiple regression model, one will wish to examine if there is serious multi-collinearity involved. We find that coefficient of correlation between price of food-grains and expenditure has a value of .0647 which is not only non-significant statistically, but it is substantially less than the value of the coefficient of multiple correlation which is as high as .955. We also find that variances of parameters of multiple regression equation are much less in value than the variances of parameters of the same explanatory variables in bivariate equations:

$$V(\hat{\beta}_1) = .00074 < V(\hat{\hat{\beta}}_1) = .0074$$

and

$$V(\hat{\beta}_2) = .007 < V(\hat{\hat{\beta}}_2) = .071$$

$\hat{\beta}_1$ and $\hat{\beta}_2$ are co-efficients of price and expenditure in multiple regression and $\hat{\hat{\beta}}_1$ and $\hat{\hat{\beta}}_2$ are parameters of bivariate regression equations respectively. Introduction of second variable does not adversely affect either the sign or the statistical significance of regression co-efficient, on the other hand, there is some improvement in the value of co-efficient of multiple correlation. Hence, these results do not suggest the presence of serious multi-collinearity.

These elasticities are comparable to Krishnan's estimate of price and expenditure elasticities which are -.2249 and .5216 respectively. This implies that during a period of six years (1959 to 1966) consumption of food-grains by farmers in India has not changed either qualitatively or quantitatively. These estimates of elasticity lend empirical evidence in support of the hypothesis that consumption curve is positively sloped while short-run supply curve of food-grains is backward bending.

CHAPTER-IV

CONSUMPTION FUNCTION FOR POST-GREEN REVOLUTION PERIOD OF HARYANA

Having established the validity of Mathur-Ezekiel hypothesis regarding consumption and sales behaviour of farmers in India, we wish to examine its validity at regional level. Thus, we take up the task of exploring the credibility of this hypothesis in regional context. In this chapter, we will attempt estimation of parameters of consumption function from data which have been collected from 'Family Budgets of Farmers in Haryana'. (11)

Recently, an attempt has been made to test the hypothesis with data relating to Punjab. We have chosen Haryana— a state which is adjacent to Punjab and the second most developed state of India, so far as the impact of green revolution is concerned. As an economy moves along its developmental path, there occurs a change in its structure, per capita income and its distribution. As an agricultural, under-developed economy, like India, develops, its agriculture tends to get commercialized to a greater extent, which in its turn, makes farmers' demand for manufactures expand. This is bound to affect their consumption, sales and stocks behaviour with respect to output of agriculture in general, and food-grains in particular. Hence, the behaviour pattern of farmers is likely to change as a stagnant economy gets transformed into a dynamically developing economy.

India is essentially "Rural Country" and Rural India is virtually dominated by the cultivators. But the marginal and small farmers constitute the bulk of total farmers. These farmers engage themselves in subsistence farming. They hardly succeed in meeting their bare minimum needs. Price fluctuations have been a constant concomitant of planned development in India and continuous hikes in prices have made life more difficult for the great mass of people living in absymal poverty. It has adversely affected development itself. Besides, it has made pattern of income distribution move in an undesirable direction. So the price stability has become an important objective of economic policy. It has also been observed that prices of food-grains have led the inflationary pressures in the Indian economy (33). In fact, elasticity of general price level with respect to prices of food-grains is as high as .896 while the elasticity of change in general prices with respect to change in food-grain prices is also high and is equal to .516 (13). In view of this, it is important to know the determinants of prices of food-grains. Since food-grains are a flexprice goods, supply and demand could be considered as their determinants. But food-grains are considered as a superior good by the farmers especially the small and marginal ones. So with the increase in their price, demand for these goods tends to rise. This makes the slope of consumption curve positive (25) . Therefore, the mechanics of change in prices of food-grains can not be explained without first determining farmers' propensity to consume, stock and sell food-grains in different price and income situations in a general equilibrium framework.

This chapter attempts to estimate the determinants of farmers consumption behaviour*. For this, we have taken the post-green revolution period which consists of six years and extends from 1970-71 to 1975-76. In post-green revolution period, high yielding varieties of seeds, the use of heavy doses of fertilizers and use of superior cultural practices are introduced. Hence, farmers behaviour with respect to consumption, stocks and sales may be different from that in the pre-green revolution period. An attempt is made to estimate the constants of determinants of the behaviour of Haryana farmers both quantitatively and qualitatively. Post-green revolution period is taken up in order to maintain the comparability with the study related to Punjab state.

Data Source:

Data for consumption by Haryana farmers have been collected from "Family Budgets". These publications contain

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* For detailed mathematical model, see Chapter II.

the information about the consumption by the farmers for twenty two commodities. Thirteen families have been selected for the study, for whom the information is consistently available for the entire period covered by the study. Incidently, these families reside in different districts. Detailed information for these families is contained in Table (I) .

Method:

"Family Budgets" survey contains information in detail for consumption of all the twenty two commodities. Out of twenty-two commodities, we have selected only five commodities, namely wheat, rice, maize, pulses and all food-grains, because these are the items , consumption and sales of which is the subject matter of our investigation. First four commodities are the part of the last commodity. Expenditure on last commodity is derived as a weighted average of the expenditure on the other four commodities.

These reports provide information about the consumption items both in physical and value terms. With the help of two types of information, implicit prices have been estimated for each family for each year separately. 1970-71 is taken as a base year.

Consumption in current prices is converted in consumption at constant prices of 1970-71. This value of consumption in constant prices is divided by the total number of adult male consuming units in the family, in order to derive values of per capita consumption. On the other hand, implicit prices of each year and each family are deflated by the prices of 1970-71, to derive the price indices with 1970-71 as the base.

Own price and income/expenditure are taken as independent variables for estimating price and income/expenditure elasticities of consumption by farmers*. Income of the family is classified into different sources such as farm cultivation, milk and milk products, interest on capital invested and miscellaneous items. The last term includes the income from rent from leased out land, lambardari fee, remuneration for recording data and extra farm income etc. So total income comprises both of farm and non-farm income. Income in current prices is deflated by general price index with 1970-71 as the base and then income in constant prices is divided by adult male consuming units for deriving per capita income. Similarly, total expenditure of each family for each year is deflated by

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* Cross price elasticity of consumption has been found to be not significant statistically.

the general price index with the same base. Expenditure is considered as a proxy for permanent income and it is considered as a better explanatory variable than income. Reasons for it have been discussed in details in an earlier chapter. Total expenditure in constant prices is further divided by adult male consuming units to derive per capita total expenditure. In order to make the three series comparable/ consumption and prices have been further adjusted for the changes in general price index.

Consumption Profiles:

Table (1) reveals the socio-economic conditions of farmers of Haryana. Our sample is comprised only of small and medium farmers. Fifty percent of the farmers belong to lower group whose holding size ranges from 1.95 to 5.99 hectares, while rest of the farmers are medium farmers, whose holding size is between 6 to 11.37 hectares. Similarly, from the point of view of income, approximately fifty four percent people are having per-capita income of more than Rs. 1000/- and the remaining 46 percent of the households are having per capita income of more than Rs. 630/- but less than Rs. 1000/-. The lowest income that any household is having Rs. 634.08 whereas per capita income in 1970-71 prices in India as a whole is Rs. 659/- in 1975-76. The rest of the families have got the income much higher than this. In the second group, the minimum per capita income is Rs. 1072.95 and highest happen to be Rs. 1791.25. From the view point of income, all these families belong to lower middle and middle income groups.

Table (15) contains the information about the estimated rate of growth of income, expenditure and output for these families over a period of time. Income grows at the rate of slightly more than two percent and this is a high moderate rate of growth. Similarly, output also grows at the rate of two percent, but rate of growth of output for all families is less than the rate of growth of income. It implies that they have varied sources of income and non-farm income has been growing faster than farm income.

Expenditure grows at the rate of 1.8 percent which is less than the rate of growth of income. Gap between the two rates of growth of income and expenditure indicates the saving habits of the farmers. These savings are done either to repay the old debts or to finance agricultural development. Thus, the savings seem to have prevented the level and structure of their consumption to rise to a level which is warranted by the growth of their income. They appear to have given due importance to requirements of growth. This explains their continuous treatment of food-grains as a superior good. If, however, their efforts at development of agriculture continue consistently for a few more years, it may be possible for them to raise their consumption level sufficiently and diversify its structure adequately in the long run. But the development that has occured so far has not been sufficient to lift the middle and small farmers of Haryana out of poverty trap so far as their consumption behaviour is concerned.

Consumption function to be estimated from time series data of each family is given below

$$\log C_{ijt} = \log \alpha_j + \beta_j \log Y_{ijt} + \gamma_j \log P_{ijt} + u \quad \ldots\ldots (1)$$

where C stands for per capita consumption, β and γ are income and price elasticities, Y is per capita income and P is price.

i = 1,2...5 for five commodities

j = 1,2....13 for thirteen families.

t = for time period.

This consumption function has been estimated by ordinary least squares method. Parameters have also been estimated from panel data. Pooling is done by combining time series and cross-section data together. In panel data, we switch from micro level consumption function to macro level consumption function.

Estimated regression equations from the panel data for all the five commodities are given below:

1. $\text{Log } C_f = .8017 + .0222 \log P_f + .40564^* \log Y$ $\quad R = .4567^*$
   t (.16035) (4.3496)

2. $\text{Log } C_w = .62105 + .06775^* \log P_w + .39622^* \log Y$ $\quad R = .44919^*$
   t (2.99223) (4.33343)

3. $\text{Log } C_R = -1.0226 + .12153 \log P_R + .48491^* \log Y$ $\quad R = .20687$
   t (.907725) (1.64426)

4. $\text{Log } C_M = -.60297 + .46081^* \log P_M + .204345 \log Y$ $\quad R = .68884^*$
   t (8.21027) (.778713)

5. $\text{Log } C_P = -.73825 - .43314^* \log P_p + .71327^* \log Y$ $\quad R = .46169^*$
   t (-3.02994) (3.25761)

Estimated equations when income is substituted by expenditure with price are given below:

1. $\text{Log } C_f = .78865 + .04068 \log P_f + .41915^* \log E$ $\quad R = .43117^*$
   t (.28619) (4.03811)

2. $\text{Log } C_w = .35344 - .00100 \log P_w + .55777^* \log E$ $\quad R = .58096^*$
   t (.906634) (6.16393)

3. $\text{Log } C_R = .39919 + .12376 \log P_R + .29122 \log E$ $\quad R = .136911$
   t (.906834) (.89382)

4. $\text{Log } C_M = .64349 + .44543^* \log P_M - .21427 \log E$ $\quad R = .68860^*$
   t (7.8837) (-.74839)

5. $\text{Log } C_P = .29536 - .45786^* \log P_P + .40752 \log E$ $\quad R = .36429^*$
   t (-3.04768) (1.63408)

where P, Y and E stand for price, income and expenditure respectively. Subscripts stand for all food-grains, wheat, rice, maize and pulses respectively. Main features of the above estimated equations are as follows:

(i) All the coefficients of multiple correlation are statistically significant except in case of rice. Their values range from .45 to .69.

(ii) Consumption curves for all the five commodities are positively sloped. Positive slope of the curve implies that with an increase in income and price, consumption also tends to increase. Positive slope of the curve occurs due to higher income elasticity. All income elasticities have got the positive sign as expected. But as against a priori reasoning, price elasticities are positive in all cases except in case of pulses. Four out of five income elasticities happen to be significant statistically. But only three of the five price elasticities are significant. Besides, only in two cases, wheat and pulses, both income and price elasticities are statistically significant. In other cases, one of the two elasticities is significant.

(iii) An interesting result is that consumption curve of all the five commodities is positively sloped. In case of pulses, the negative price effect is completely swamped by the positive income effect. Consequently, the overall consumption curve is positively sloped. In case of wheat, rice and all foodgrains income elasticity is larger than the positive price elasticity and it is only in case of maize that the positive price elasticity exceeds positive income elasticity. Hence, in all these four cases, income happens to be a more decisive determinant of the location of the consumption curve. Four out of five price elasticities have got positive sign. Positive sign ~~with~~ of price elasticity implies that with the increase in the price of particular commodity, the demand for that commodity tends to increase. This happens only in case of superior commodities. In such commodities, when prices are low, demand is also low but as the prices move upward, the demand also changes in the same direction. So in the above results, except pulses all other commodities are treated as superior goods. In case of pulses, it has got negative sign with price elasticity and positive with income elasticity. It is also treated as superior commodity like other goods, but on the bases of larger income effect.

There occurs a quantitative as well as qualitative change in three out of five cases when expenditure is substituted for income as an explanatory variable. Main features of these results are as below:

(i) The co-efficients of multiple correlation are significant in four out of five cases, except in case of rice. Their values range from .36 to .68.

Thus, there occurs not much change in the coefficients of multiple correlation due to substitution of expenditure for income.

(ii) Consumption curves for all food-grains, wheat, rice and maize happen to be positively sloped. But with the change of explanatory variable, positive slope of consumption curve of pulses has become negative.

(iii) With the substitution of expenditure for income, there occurs no quantitative change in the results in case of all food-grains. But in case of rice significant price-elasticity becomes non-significant.

(iv) In case of wheat both quantitative and qualitative changes occur. Positive and significant elasticity becomes negative and non-significant. On the other hand, magnitude of expenditure elasticity is increased with the substitution of expenditure in place of income. Even the magnitude of the coefficient of correlation increases.

(v) In case of maize, positive income elasticity is changed to a negative and non-significant expenditure elasticity. Positive price elasticity is larger than negative expenditure elasticity and it makes the consumption curve slope upward.

(vi) Replacing income by expenditure in case of pulses, positive income elasticity decreases in magnitude as an expenditure elasticity; it occurs non-significant statistically. Value of coefficient of multiple correlation also decreases.

(vii) All the five commodities happen to be superior good for the farmers when income has been taken as explanatory variable. With the replacement of income by expenditure, four out of five i.e. all food-grains wheat, maize and rice happen to be superior goods.

If we compare these results with the results derived in a study of Punjab farmers (44) we find that the farmers of both states treat all the five commodities as superior commodities. It implies that with an increase in price and income, the demand for these goods tends to rise. In fact, consumption levels of these farmers are so low that with the increase in output and income, they raise their consumption rather than augmenting sales to the market.

There occurs a difference between the two studies and it is that, in case of Punjab study, results are not affected when expenditure is substituted for income. Expenditure is considered as a proxy for permanent income. But in case of this study, results are affected quantitatively as well as qualitatively, in case of wheat, maize and pulses.

The reason for such a difference seems to be that in Haryana agricultural output does not seem to have been immunised to the adverse weather conditions as it has been in Punjab.

Another important point is that in her study, positive slope of consumption curves happen to be due to larger positive income effect but in this study positive slope emerges due to positive price and income effects.

There seems to be a difference in the composition of the two samples. Sample in her study is comprised of small, medium and large farmers. While in our study sample is comprised of only small and medium farmers. The results in her study reveal that even till today medium and larger farmers in Punjab have not got the saturation point of consumption. They treat food-grains as superior commodities.

Above pooled results are strengthened by the estimated results derived from time-series analysis. These are discussed in detail in Appendix-A. If on the basis of the results derived from all India data, we assess the behaviour pattern of Haryana farmers in pre-green revolution period, we find that their behaviour pattern with respect to consumption is almost similar in post-green revolution period. Hypothesis of positively sloped consumption curve is valid even at regional level.

CHAPTER-V

DETERMINANTS OF MARKETABLE SURPLUS: A CASE STUDY

Output and prices of food-grains play a pivotal role in developing countries. Agriculture is important not only because it sustains 2/3rd of total humanity but it is important because it happens to be the life line of national economies and the foundations of national wealth and welfare of the most of the countries of the world. Notwitnstanding, the heat in Indian economy generated by occasional shortages of agricultural commodities in particular years, the annual compound rate of growth of output of cereals is 3 percent which is highly impressive indeed. Besides, food-grains account for as high as 80 percent of total cultivable area and a very high proportion not only of total agricultural output but also of gross domestic output.

Changes in output are accompanied by changes in prices of agricultural goods which change the sectoral terms of trade. Since income of farmers changes in the same proportion in which prices of agricultural goods change, change in output shifts the pattern of income distribution directly as well as via prices. Thus, income distribution and agricultural prices are not independent of each other .

Agrarian structure as reflected in differences of size of holdings affects marketable surplus, to a great extent. It is generally seen that marginal and small farmers engage themselves in subsistence farming; while cultivation on commercial scale is taken up by medium and large farmers alone. A great proportion of marketable surplus of small farmers is accounted by distress sales. But a large proportion of marketable surplus of large and medium farmers is in the nature of commercial sales. Thus, the former group of farmers treat consumption of food-grains rather than marketable surplus as a residual. Consequently, supply curves of food-grains, in the short-run, are backward bending; while consumption curves of food-grains are upward sloping (25, 27, 37). But the supply curves of food-grains, in case of second group of farmers, may have the normal upward slope and consumption curves may slope downwards. Perverse behaviour with respect to consumption and sales of food-grains affect both demand and supply simultaneously. In this chapter, we attempt to estimate farmers' propensity to sell food-grains in different income/output situations. As the following study is based on a cross section of house-holds belonging to the same village in a given year, all of them have faced the same price situation. We therefore, have not been able to derive estimates of price elasticity of marketable surplus.

DATA SOURCE:

Data relating to variables of marketable surplus have been taken from a census survey of Sunher village. A detailed schedule was convassed among the respondents and data have been gathered by personal interview. Out of total 310 households in the village, 150 are engaged in cultivation. Rest of the households belong to other occupation groups. Though 25 non-respondents were recorded yet none of them is an agriculturist. Data collected by us relate to a period of three years 1976-77, 1977-78, 1978-79. The figures used are averages of the three years, so that they are not likely to be affected by cyclical changes in weather conditions being especially favourable or unfavourable in a particular year.

Methods and Empirical Results:

What proportion of food-grains is released to the market depends upon farmers needs for human consumption, seeds, cattle-feed and their capacity to hold stocks, and future prospects of prices. In this study, attempt for estimation of relationship between marketable surplus and output/income on the one hand and marketable surplus and size of holding on the other hand, is made. Due to non-availability of data about stocks, we have used the term marketable surplus in our study. Wheat, Paddy and all food-grains have been selected for this study. First two commodities are constituents of the last commodity. Marketable surplus of all food-grains is obtained as a weighted average of marketable surplus of first two commodities. We have the information of production and sale of commodities in physical terms. Area held by each of the 150 households was also given. We divided all the households into four different size groups.

Size and Marketable Surplus:

Agrarian structure is one of the factors that affect marketable surplus. Agrarian structure is determined mainly by land relations, which in their turn, get reflected in size distribution of holdings. So, it is assumed that size of holding is an important determinant of marketed surplus. Few attempts have been made to estimate relationship between size of holding and marketable surplus. However, their findings are strikingly different. Here we have tried to test the hypothesis that short-run supply curve of food-grains are negatively sloped with latest data. Table (7) reveals that income/output and marketable surplus of wheat, paddy and all food-grains per house-hold increase with size. Thus, the table lends support to the hypothesis of a positive relationship between size of holding on the one hand, and income, output and marketable surplus on the other hand. Besides, marketable surplus, both of wheat and paddy, as a proportion of output also increases steadily with size while in case of all food-grains, it increases from first to second group, but declines negligibly from second to third group and increases thereafter. An implication of an increase in marketable surplus as a percentage of output with an increase in size is that self consumption of wheat, paddy and all food-grains decreases with an increase in size of holding. Another important point comes out that proportions of output sold by various groups are quite high and these percentages do not seem to differ much from one group to another.

For statistical significance, we have tested differences of these proportions, and we find that it is only the first group which differs significantly from other groups jointly as well as separately both in case of wheat and paddy. But in case of all food-grains, differences between these proportions are statistically significant for all four groups jointly as well as separately. Both wheat and paddy occur as a cash crop for all groups of farmers except the first group. This is due to the fact that farmers belonging to first group consume themselves much higher proportion of their produce than those belonging to higher size groups.

Results of this study stand in contra-distinction to those of Dharm Narain, according to whom, marketed surplus as a proportion of output declines as size of holding increases upto the size group 10 to 15 hectares, it rises thereafter with size of holdings. However, these results are similar to those of Utsa Patnaik(31)RBI (28) Sharma(41) and George and Singh (43).

Wheat

The relative share of farmers of different groups in total marketable surplus are shown in table (9). Percentage share in total marketable surplus of wheat increases consistently with an increase in size of holding upto third group; and it declines marginally from third to fourth groups. Within the first group itself, those farmers size of whose holdings is less than 2 hectares, account for as negligible as 0.44 percent of total sales, whereas their share in total output is 0.51 percent. Farmers size of whose holdings is between 2 to 3 hectares, account for 2.36 percent of total sales, whereas their share in total output is 2.87 percent; and the farmers size of whose holdings is between 3 to 5 hectares, account for 8.19 percent of total sales and 9.08 percent of total output respectively. If we consider these farmers, as a whole, they account for only 10.94 percent of total sales while their share in total output is 12.44 percent. Hence, the contribution of these farmers separately as well as jointly to sales is commensurate with their contribution to total output.

Contribution to total sales and output of wheat of I group of farmers, taken as a whole, as well as in sub-groups, relatively to large farmers is extremely low . Has the proportionate share of small farmers in output been significantly higher or lower than their proportionate share in marketable surplus, then their behaviour would have been different from that of farmers belonging to large size groups. Thus, in our study, size does not emerge as an important determinant of marketable surplus, in case of these farmers. As for other three groups, their relative contribution to total sales does not seem to differ significantly even though each of these groups' contribution is nearly 3 times the contribution made by the first group. Relative share in output of the other three groups comes out to be 29.93, 19.68 and 27.91 percent, respectively, which in its turn, is 2½ times the share of small farmers. It means that the relative shares of different groups of farmers in the total ~~share~~ sales are commensurate with their relative shares in output.

Paddy:

Results for paddy are almost similar to those of wheat. First three sub-groups of farmers account for as little as 0.55 percent, 4.05 and 6.03 percent of total sales of paddy respectively, while their corresponding shares in production are 0.62, 4.22 and 6.49 percent.

All three sub-groups taken together, contribute as low as 10.59 percent of total sales and 11.32 percent of total output. We find, in our study, that contribution of small farmers to sales and output of wheat and paddy relative to that of large farmers is extremely low. Thus, these results show that output and market arrivals of wheat and paddy both are not likely to be affected greatly by changes in output and marketable surplus of small farmers because they sell as large as 71 and 85 percent of their total output of wheat and paddy respectively. These results also confirm positive association between marketable surplus and size.

Regression equations of marketable surplus of wheat and paddy as a proportion of total output on size of holding from 150 observations estimated by ordinary least square method are given below:

$$\text{Log}\ \frac{M_w}{O_w}_t = 2.065 + .188 \log S \quad (r^2 = .00115)$$
$$(.4128)$$

$$\text{Log}\ \frac{M_p}{O_p}_t = -.607 + .3430^{*} \log S \quad (r^2 = .0727)$$
$$(3.47)$$

Both regression and correlation coefficients are positive in both the equations. However, variation in size explains as little as .12 and 7.27 percent of total variation in marketable surplus as a proportion of output and size elasticity in case of both wheat and paddy is as low as 0.19 and .343 which means that, though marketed surplus as a proportion of output increases with size, yet the increase is not different from zero statistically. The statistical significance of these coefficients, however, seems to be a consequence of large size of sample. It seems that insufficient variation in size within individual groups affect the statistical significance of parameters estimated from group data. If we remove this constraint both correlation and regression coefficients emerge statistically significant. This seems to be an odd result in view of our finding that size is a non-significant determinant of marketable surplus.

Estimated equations for each group separately are given in table (8) . Important features of these results are as follows:

1. Regression and correlation coefficients are not significant statistically for any group either for wheat or for paddy.

2. Marketable surplus of wheat as a proportion of output is positively related with size in case of first and third groups; while there is an inverse relationship for second and fourth groups respectively.

3. Marketable surplus of paddy as a proportion of output shows positive relationship for first and fourth groups, while an inverse relationship between size and marketable surplus is revealed for other two groups.

Thus, the relationship between size of holding and marketable surplus as a proportion of output is neither uniformly positive nor negative for four groups examined separately. Statistical non-significance of estimated elasticities may probably be due to insufficient variation of size of holdings within a given group. However, when individual observations for all groups are taken together, constraint of insufficient variation in size is removed. Though estimated elasticity turns out to be positive, yet it is not significant statistically in case of wheat, as large as 148 degrees of freedom notwithstanding.

Therefore, our results do not lend support either to positive or negative relationship between marketable surplus of wheat and size of holdings, and thus, size of holding does not seem to be a decisive determinant of marketable surplus either separately for four groups or jointly.

Homogeneity of Means:

Output and income are generally highly and positively correlated with size of holdings. As there is a very high degree of variation in size (1 to 60 hectares) both output and income are also likely to show an equally sharp degree of variation. These variations might cause group means to be significantly different. Hence Thus, we test the data for homogeneity of means of income and output as well as the homogeneity of mean of dependent variable i.e. market sales for different size groups of holding. While keeping this in view, sampled households have been divided into four different groups according to area owned. First group consists of small and marginal farmers, size of their holding ranges from 1 to 5 hectares, second and third group is that of medium farmers whose holding ranges from 5 to 10 and 10 to 20 hectares respectively. Last group consists of large and rich farmers whose holdings range between 20 to 60 hectares. In order to test the homogeneity of means, weighted means of per capita output and sales of each group separately as well as jointly are calculated. While comparing group means with composite mean, mean differences have been tested estimated by the following formula:

$$Z_i = \frac{(\bar{X}_j - \mu) \times \sqrt{n_i}}{\sigma}$$

where X_j stands for means of jth group μ is the composite mean of all groups taken together, σ is standard deviation of the composite series and n_i is the size of ith group. Values of Z statistics are as follows:

Z Statistics

Group	Wheat Output	Sale	Paddy Output	Sale	Income
1	2.08966*	2.0925*	2.2007*	2.353	3.7308*
2	.02586	.05458	.8474	.8635	.5774
3	.04050	.1763	.09747	.0974	.19026
4	2.7502*	2.6431*	3.6183*	3.7077*	4.3706*

Above results show that means of first and last groups differ significantly from composite mean for all five series, while means of second and third groups do not differ from composite mean each other significantly. As expected, difference between means of these two groups themselves do not differ significantly from zero. Inter group differences are tested by the following formula:

$$Z = \frac{\bar{X}_i - \bar{X}_j}{S}$$

where $\bar{X}_i$ is the mean of ith group and $\bar{X}_j$ is the mean of jth group and S is the standard deviation of two groups combined together.

Thus, it is the richest and the poorest who differ not only among themselves but also differ from all farmers taken together. But middle level farmers neither differ among themselves nor from all farmers taken together.

II. Output as Determinant of Marketable Surplus:

Output is considered as an important determinant of marketable surplus. Total elasticity of marketable surplus with respect to output has been estimated for all the four groups taken together as well as for each group separately by the following equation:

$$\text{Log } M_j = \log \alpha_0 + \beta_i \ \log X_j$$

j = wheat or paddy
i = income or output
M = Marketable surplus.

An important property of this curve is that it has the same constant value of elasticity at every point of estimated line. Equations estimated by OLS method from data for each group taken separately for both wheat and paddy are reported in table (8) . Regression equation estimated from composite data of wheat is given below:

$$\text{Log } M_W = - .1853 + 1.0519^{*} \log O_W \qquad (r^2 = .9322^{*})$$
$$t \qquad (45.1102)$$

Coefficients of correlation and regression are positive and highly significant. Changes in output explain as high as 93.22 percent of total variation in sales of wheat. Output elasticity is not only positive but it is slightly greater than unity also, which means that marketable surplus responds more than proportionately to changes in output.

Estimated equations for all the four groups show that output elasticity of wheat and coefficient of correlation are positive and highly significant statistically. Elasticity for the first two groups is slightly more than unity and it is slightly less than one for the last two groups, which implies that response of marketable surplus to changes in output is more in case of all farmers taken together and in case of first two size groups than what is in case of last two groups. Thus, the behaviour of small farmers is similar both quantitatively and qualitatively to that of all farmers taken together. Output elasticities of marketable surplus of wheat reveal that market sales of small farmers are more responsive to changes in output than the sales by large farmers. These results reveal that changes in output account for as much as 93, 81, 90 and 98 percent of total variation in marketable surplus of wheat.

Regression equation in case of paddy for all groups of farmers taken together is given below:

$$\text{Log.}\, M_p = -\ .02986 + .9899^{*} \log O_p \qquad r^2 = .9498^{*}$$

$$t\ (52.92)$$

Both regression and correlation coefficie

positive and highly significant statistically. Changes in output explain as high as 95 percent of total variation in sales. Elasticity of output is less than unity which implies that the sales respond less than proportionately to changes in output of paddy. Results, when all the four groups are taken together, show that output elasticity of paddy and coefficient of correlation are positive and highly significant statistically. Changes in output of paddy account for as high as 92, 90, 98 and 100 percent of total variation in marketable surplus for all the groups. Output elasticity is slightly more than one in case of last two groups and less than one in case of first two groups of farmers. An interesting point to note is that output elasticity of wheat is more than one in case of first two groups while in case of paddy, it is more than one in case of last two groups. Thus, for larger farmers, paddy is a commercial crop to a large extent, than what it is to the small farmers, or all farmers taken together.

Income as Determinant of Marketable Surplus

Regression equation of marketable surplus on income of wheat estimated from all 150 observations is given below:

$$\text{Log } M_w = 2.7968 + .5475^{*} \log Y \qquad (r^2 = .4922^{*})$$

$$t \qquad (11.98)$$

Correlation and regression coefficients are positive and highly significant statistically. Changes in income explain only 40 percent of total variation in sales. Thus, output is more decisive a determinant of marketable surplus of wheat than income. Income elasticity is much less than unity (0.55) in case of 150 observations taken together. In case whole of the income is derived from agriculture, output and income would be perfect substitutes for each other. In case, income from sources other than agriculture is derived, there will be divergence between income and output. Greater the proportion of income derived from other sources, greater will be this divergence and smaller will may be the effect of change in income upon marketable surplus. An implication of these results is, therefore, that farm households studied have got diverse sources of income and they seem to be deriving a substantial proportion of income from these other sources.

All income elasticities of wheat and coefficient of correlation are positive and statistically significant except for the fourth group. Variation in income accounts for only 60, 66 and 37 percent of total variation in marketable surplus of wheat of first three groups. But in case of fourth group, it accounts for only 7 percent of total variation. Another difference is that income elasticity of wheat is much less than the output elasticity for all four groups. Only for the first group, it has a somewhat high value that is 0.92; while for other three groups, it is as low as .49, .57 and .14. It implies that marketable surplus is less responsive to changes in income than output. Income elasticity is not greater than output elasticity for any individual group as well as all the groups taken together.

Regression equation estimated from 150 observations for paddy is as follows:

$$\text{Log } M_p = 2.6622 + .60319^{*} \log Y \qquad (r^2 = .5978^{*})$$
$$t \qquad (= 14.8327)$$

Regression and correlation coefficients are positive and highly significant in case of paddy also. Above equation shows that changes in income explain 59.78 percent of total variation in marketable surplus. Income elasticity is less than unity which is 0.60 and it is greater than the income elasticity of wheat. For the individual four groups, results are similar. But the proportion of variation in it explained by changes in income are as low as 39, 46, 60 and 27 percent for four groups. Values of elasticity range from .35 for the fourth group to .60 for the third group.

Income elasticity, like output elasticity, for the last two groups in case of paddy, is greater than its value for the first two groups. Another feature of these results in this study is that income elasticity of market surplus of paddy is much less than income elasticity of wheat for each of the four groups.

Thus, all above results and discussion, lend a very strong empirical support to the hypothesis of there being a positive relationship between income and marketable surplus and marketable surplus and output. But output happens to be a much more important determinant of marketable surplus than other factors such as income or size of holding . This may be due to the degree of diversification of sources of income. Greater the proportion of income derived from a particular crop/all crops, smaller will be the difference between output and income elasticities.

Another feature of these results is that sales behaviour of farmers in different income/output groups seems to be different. Hence, we have tested homogeneity of regression parameters with the help of Chow statistics. For testing homogeneity the assumption of group data are treated as the sub-sample of the data of all the farmers taken together. F ratios are tabulated below:

F ratios:

	Wheat		Paddy	
	M_W and O_W	M_W and Income	M_P and O_P	M_P and Income
F	7.2852*	88.7242*	22.822*	3.3596*

These values of F ratios show that estimated regression parameters attached to income and output in case of both the commodities: wheat and paddy, are significantly different, which lends support to the view that farmers belonging to different income/output groups respond differently in quantitative terms to changes in income and output, so far as their sales behaviour is concerned. However, there does not occur any qualitative difference because all the elasticities have positive sign. Thus, we find that there is not much significant difference, qualitative or quantitative, in the behaviour of farmers belonging to different income/size group drawn from non-regressed statistical analysis is not supported by these results.

Significant differences of group variances may cause heteroscedasticity which makes OLS method of estimation inappropriate. So keeping in view the significant differences between parameters estimated from data for each group of farmers separately and the significant mean differences, we test our results for homogeneity of variances of residuals of the entire sample consisting of 150 observations.

The differences of varainces have been examined by X^2 test given below:

$$M = C^{-1} \left(n \log \frac{S}{n} - \sum ni \log \frac{S_i}{ni} \right)$$

$$C = 1 + \frac{\sum \frac{1}{nj} - \frac{1}{n}}{3(K-1)}$$

$X^2.05$ for 3 d.f = 7.815 where S_i is the sum of squares of deviations from the mean of ith sample, $\frac{S_i}{ni}$ is the variance of ith sample; nj = nj-1 and K is the number of parameters estimated. Calculated results are tabulated below:

		Wheat	Paddy	All food-grains
1.	M =	42.38*	93.99*	170.329*
2.	C =	1.015	1.015	1.015

Above values show that variances are significantly different for wheat and paddy and all food-grains taken together. So null hypothesis of homogeneity of variances is rejected. In view of this, we have estimated the parameters for different groups separately. We can, therefore, not put much reliance in elasticities estimated from data of all sampled households taken together.

Important features of the study are as follows:

a) Size is not a decisive determinant of marketable surplus. If there is any influence of size on marketable surplus, it is not direct. It might be exercising its influence via income and/or output.

b) Consumption levels of small and marginal farmers are low, so they treat food-grains as a superior good even in post-green revolution period. Increase in output and income raises only their consumption rather than augmenting market sales. Therefore, an inducement or incentive in the form of higher prices is not likely to affect either the sales behaviour of these farmers, so long as their pent up demand is not satisfied completely.

c) Paddy, for medium and large farmers, is wholly a commercial crop while wheat is partially but largely a commercial crop. It is because wheat constitutes staple diet of the people of this region and rice is consumed only once in a while by most of the households of this region.

d) As the amount of paddy and wheat withheld by farmers of different groups for their own use is as large as can satisfy only their own requirements of self-consumption, it does not indicate the probability of large stocks being held for speculative purposes. So any policy of inducement or incentive can not substantially raise market arrivals.

e) Both output and income have been found to affect marketable surplus significantly for all groups of farmers taken separately as well as jointly. Hence, incentives and inducements to raise output or income, whatever be their form, are the means through which market arrivals can be raised largely. But even the medium and large farmers do not have the stocks in their possessions to operate with in order to affect prices prevailing in the market at any time, once the level of output/income is determined.

f) Another important implication of above results is that if one wants to enlarge the size of marketed surplus either for building buffer stocks or for meeting ever increasing urban demand for food-grains or to keep the price fluctuations within the limits during the periods of shortages, efforts and inducements should be directed towards medium and large farmers as small farmers contribute very inconsequential if not negligible proportion of total marketable surplus.

CHAPTER-VI

SUPPLY FUNCTIONS OF HARYANA

Production and productivity in the farm and factory sectors are looking up, but the Indian economy is still in the woods, due to inflationary trends, supply bottlenecks especially of infra-structural facilities and trade gaps etc.. While industrialised countries can grow without let up or hinderance despite inadequate expansion of agricultural sector, shortages being made up by imports from other countries, the situation is different in a country like India.

In recent years, role of agriculture in the process of growth of Indian economy is high-lighted as the largest contributor to domestic output and as the absorber of the largest proportion of labour force. In fact, the overall growth performance of Indian economy is determined by the growth of agriculture. If the growth of agricultural output is high, the whole economy gathers momentum and becomes buoyant and whenever agricultural output has shown signs of decline or even stagnation, the whole economy slides down, massive efforts of industrialization notwithstanding (34). But in the present situation, what is far more germane to the process of growth is to increase marketed surplus out of increased production. There is need to expand internal marketed food-surplus.

Marketing of agricultural produce is the crux of the rural economy of our country. Marketing is not only the final act in a series of agriculturists' operations but the one which governs and directs every activity throughout the year. In fact, sweet is of the middleman and sweat goes to agriculturist. Farmers, in developed countries, sell a large amount of the produce after keeping a small part of it for their self-consumption. While situation is reverse in under-developed countries like India. In such countries, farmers sell only that part of the produce which will provide them sufficient cash. In a situation of this type, consumption is treated as a residual. In developed countries, savings are mostly in the form of cash due to commercialization of agriculture and monetization of the economy, while in developing countries, farmers feel safer with savings in kind. This is due to uncertain weather conditions.

Our sample of study is comprised of small and middle farmers, while large farmers constitute microscopic minority in the sample, Cash requirements of small and medium farmers determine the size of marketable surplus. With a rise in the prices, they sell less and with a fall in prices, they sell more in order to fetch requisite cash for their needs. Due to fixity of cash-requirements, there exists an inverse relationship between marketable surplus and prices. Thus, this inverse relationship makes the short-run supply curve backward bending.

Output and income happen to be other determinants of marketable surplus. Relationship between output and marketable surplus is important from the point of view of policy. With the increase in output and rise in prices, farmers sell less because this enables them to get required cash and vice-versa. With the fall in output and fall in prices, they have to sell more while suppressing their own needs. So with the increase in output, they satisfy their pent up demand. This is, by and large, true about marginal and small farmers. Normally, there occurs a positive relationship between marketable surplus and output; marketable surplus and income. We expect the same behaviour pattern of farmers in case of Haryana. In this chapter, an attempt is made to estimate elasticity of marketable surplus.

DATA SOURCE AND ADJUSTMENTS:

We have studied the same five commodities; all food-grains, wheat, rice, maize and pulses. Data for these commodities have been collected from "Farm Accounts of Haryana Cultivators' and 'Family Budgets', same thirteen families have been selected for the study. Data have been collected for six years which extend from 1970-71 to 1975-76.

The quantum of sales to market depends upon farmers own needs for human consumption, seeds, cattlefeed and stocks etc. Due to non-availability of data about stocks, we are using the concept of marketable surplus. As the data about marketable surplus is not provided in the reports, so we have tried to estimate it in this chapter on the basis of the model which is discussed in Chapter (II). Marketable surplus has been estimated for five commodities. Marketable surplus of last commodity i.e. the marketable surplus of all food-grains has been estimated as a weighted average of marketable surplus of first four commodities and weights are proportional to the quantities sold.

(i) Consumption:

These publications contain the information about the farmers' consumption of different commodities both in physical as well as in value terms. With the help of such information, implicit prices have been estimated for each family for each year separately. Consumption in current prices is converted into the consumption in constant prices, with 1970-71 as base year. Then, the value of consumption at constant prices is divided by adult consuming male units in order to derive per capita consumption.

(ii) Cattle-feed:

'Farm Accounts" reports provide the information about the expenditure on per pair of bullocks and number of bullocks owned by each family in each year. Expenditure on a pair of bullocks in current prices has been converted into the value at constant prices with the same base year. In order to get the total expenditure on cattle-feed, we have multiplied the expenditure on a pair of bullock in constant prices by the number of bullocks kept by each family.

(iii) Seed-requirement:

Farm Accounts' survey provides the information for the expenditure on seeds per hectare. This expenditure on seeds per hectare in current prices has been converted into the expenditure in constant prices, with the help of implicit prices of 1970-71. We made an assumption over here that only for wheat and rice crops HYV seeds are used. So in order to calculate total, expenditure on seeds, area under two crops have been multiplied by constant price expenditure per hectare.

(iv) Amount purchased from outside:

Reports contain the information of these commodities which are purchased from the market only in money terms. These money values are divided by the implicit prices of goods consumed in current prices. Then these physical quantities of goods purchased from market are converted into money terms in constant prices of 1970-71.

(v) Output:

These reports provide the detailed information about the output of twelve different commodities both in physical and monetary terms, with the help of which the implicit prices have been estimated for each family for each year separately. Physical quantities of output have been multiplied by implicit prices of 1970-71 for estimating output in constant prices.

Thus, marketable surplus has been estimated with the equation (26) in chapter II . Output, income and cash-requirements are taken as explanatory variables for estimating elasticities of marketable surplus with respect to these variables. Income from both the sources; farm and non-farm income is deflated by general price index with 1970-71 as a base year. This deflated income is divided by adult male consuming units, in order to derive per capita income.

(vi) Cash-requirements:

Farmers need cash in order to satisfy their needs. We have divided the cash requirements into two parts:

(a) Cash-requirements for consumption.

(b) Cash-requirements for production.

(a) Cash-requirements for consumption:

This includes the expenditure on those items which are being purchased from the market such as expenditure on food, fuel, clothing, housing, lighting, medicine, travelling, education, religion, social amusement and miscellaneous. Expenditure on food comprises of the expenditure on wheat, maize, milk and milk products, rice, pulses, sugar, oil and vegetable ghee, vegetables and fruits, salt and miscellaneous. These items of food consumed are partially purchased from the market and are partially self-produced. "Family Budgets" contain the information of items purchased from the market only in monetary terms, and implicit prices are estimated for each year and for each family separately. With the help of implicit prices, the physical quantities of different commodities purchased from outside are derived. Thus, it is impliedly assumed that total quantities of all the goods are evaluated in the same implicit prices irrespective of their source being the market or self-production. It is just an approximation in the absence of relevant information. These estimated quantities of items purchased from outside are converted into value terms in constant prices of 1970-71.

Domestic expenditure on items other than food is also converted into value terms in constant prices of the same base year. In order to derive marketable surplus, same year is taken as a base. Expenditure on clothing in different years is deflated by the whole-sale price index of textiles; expenditure on medicine is deflated by the price index of drugs and medicines. Expenditure on lighting is deflated by the weighted price index of mineral oils and electricity, because it is not specified in the reports that expenditure is either on electricity or oils or on both the items. So average of both the indices is taken. Commodity composition of different items is not specified properly. So we have deflated the expenditure by general price index. Due to non-availability of the data on retail price indices of all the commodities, we have used whole-sale price index. In order to calculate the total cash-requirements for consumption purposes, expenditure estimated in the above way on different items is added.

(b) Cash-requirements for production:

Another part of the total cash requirements is the demand for cash for production purposes. 'Farm Accounts' contain the information about the expenditure per hectare both for irrigated and unirrigated areas separately. Cash-requirements for production are taken into account only of those items which are partly or totally purchased from the market. Table relating to total expenditure per hectare consists of detailed information about expenditure on manual labour, bullock labour, artisans, implements and wells, fertilizers, seeds, water-rates, rents and land revenue and miscellaneous.

In the reports themselves, the expenditure incurred on hired labour, both casual and permanent hired labour is given. This total expenditure on labour is deflated by cost of living index for agricultural workers with 1970-71 as base year.

Expenditure on artisans is similarly deflated by cost of living index with the same base. Expenditure on water-rates, rent on land leased in and land revenue are estimated at the rates which were prevalent in 1970-71. Expenditure on fertilizers is given separately in the reports which is exclusive of the expenditure on manure which is largely produced on the farms. Expenditure on fertilizers is deflated by whole-sale price index of fertilizers. Expenditure on seeds includes the expenditure on the type of seeds which are purchased from outside. It is assumed that only high yield variety of seeds are purchased from market for wheat and rice.

Expenditure on bullocks labour that enters into calculation of cash requirements consists of those items which are purchased from outside in order to maintain their bullocks. These items are such as oil cakes, oil, gur, oil seeds and salt. These are calculated at the prices of 1970-71.

Expenditure on implements and tube-wells has been calculated firstly by deducting two percent of agricultural income as depreciation charges from the total expenditure and then this expenditure is deflated by the combined index of machinery, electricity and mineral oil. Expenditure on other items is deflated by general price index as these are not properly specified in the reports. In order to calculate total cash-requirements for production purposes expenditure on all the items is summed up.

In order to estimate total cash-requirements for the farmers, two different types of cash-requirements are added. These cash-requirements are divided by adult male consuming units in order to derive per capita cash-requirements. In order to make all the variables comparable, these are adjusted for the changes in general price index.

Empirical Results:

Marketable surplus has been regressed upon output, income and cash-requirements. All the variables are taken in per capita items. It may be noted that prices have already been used as a determinant of consumption, which in its turn has been used for estimating marketable surplus. Therefore, all degrees of freedom that we have had with prices have already been exhausted. We can not use them again for estimating price elasticity of marketable surplus. Besides, price elasticity of marketable surplus is already available to us from equation (33) of the model. In order to know the association between marketable surplus and other independent variables, we have calculated compound rate of growth of different variables. All these variables are calculated in per capita terms. Table (15) contains these results.

Rate of growth of cash-requirements is positive for all the families. The value of these rates of growth for all the families range between 1.13 to 2.17. Similarly, output has grown positively for all the families. Output of all food-grains has been considered. Thus, the range of rate of growth of agricultural production is 1.18 to 2.18. Dependent variable-marketable surplus has also grown positively for all the families. The rate of growth ranges from .82 to 2.09.

In order to examine the relationship between marketable surplus and independent variables, we have applied the sign test. Positive sign is allotted when both the rates of growth are positive~~ly growing~~. Inverse relationship between price and marketable surplus implies that with the increase in demand for cash-, marketable surplus tends to increase. So there exists a positive relationship between cash-requirement and marketable surplus. Table (15) shows that all the families have got positive signs for both the rates of growth. So these lend empirical support to the hypothesis of positive relationship between cash and marketable surplus.

Increase in output leads to increase in the income which reflects the higher level of development. This increased output is partially used for consumption purposes and it partially augments the sale for markets. Market-sales will increase only when cash-requirements are positively growing. Output for all the families is growing and similarly, the cash-requirements are also growing. Thus, all the families have got positive sign for both output and cash-requirements. It implies that increase in output/income induced the farmers to increase the demand for goods or invest the money in superior cultural practices. Here the assumption of fixity of cash-requirement is relaxed.

In the last column of the table sign test is applied to know the association between output and market-~~able~~ surplus. All the families have got positive sign for both these rates of growth. So there exists a positive association between the two. But the rate of growth of marketable surplus is less than the growth of output which implies that with the increase in output, consumption also tends to rise. Thus, these empirical results strengthen the hypothesis proposed by Krishnan (21) that Mathur-Ezekiel theorem can be derived while relaxing the assumption of fixity of cash-requirement.

Marketable surplus has been estimated by OLS method. Elasticities with respect to different variables have been estimated from time-series data for all the five commodities. Estimated elasticities are reported in the tables (10 to 14) and are discussed in detail in Appendix B.

Here we have tried to estimate the elasticities for marketable surplus with different variables from the panel data. Pooling is done while combining the cross-section and time-series data together.

Estimated equations with respect to cash-requirements, output and income are given below:

1. $\text{Log } M_W = 1.270338 + .401699 \log K$ $\quad R = .113565$
   $t \quad (.99648)$

2. $\text{Log } M_R = -.12963 + .53002 \log K$ $\quad R = .100696$
   $t \quad (.88233)$

3. $\text{Log } M_M = -.20983 + .22045 \log K$ $\quad R = .04784$
   $t \quad (.41756)$

4. $\text{Log } M_P = 1.09559 - .35595 \log K$ $\quad R = .09459$

$t \quad (-.82832)$

5. $\text{Log } M_F = .23095 + .883807^* \log K$ $\quad R = .34571^*$

$t \quad (3.21183)$

II

(i) $\text{Log } M_W = -3.5399 + 2.2166^* \log O_W$ $\quad R = .78473^*$

$t \quad (11.03675)$

(ii) $\text{Log } M_R = -.114255 + .994111^* \log O_R$ $\quad R = .9615066^*$

$t \quad (30.50499)$

(iii) $\text{Log } M_M = -.27036 + .84251^* \log O_M$ $\quad R = .72277^*$

$t \quad (9.3877)$

(iv) $\text{Log } M_P = -.31434 + 1.05092^* \log O_P$ $\quad R = .841948^*$

$t \quad (13.60360)$

(v) $\text{Log } M_F = -2.18825 + 1.71560^* \log O_F$ $\quad R = .80644^*$

$t \quad (11.88945)$

III

(i) $\text{Log } M_n = 1.56842 + .25270 \log Y$ $\quad R = .072407$

$t \quad (.632891)$

(ii) $\text{Log } M_R = -1.20261 + .82121 \log Y$ $\quad R = .158126$

$t \quad (1.39608)$

(iii) $\text{Log } M_M = -2.49982 + .954899 \log Y$ $\quad R = .210034$

$t \quad (1.87281)$

(iv) $\text{Log } M_P = .148267 + .003347 \log Y$ $\quad R = .000901$

$t \quad (.007858)$

(v) $\text{Log } M_F = -.099197 + .817988^* \log Y$ $\quad R = .32429^*$

$t \quad (2.98857)$

Values in the paranthesis are t values.

* Significant at 5 percent level.

Where O is per capita output, Y is per capita income, and K is per capita cash-requirements. Subscripts stand for wheat, rice, maize, pulses and all food-grains. Main features of the above exercises are as follows:

(i) Co-efficient of correlation in case of cash is significant statistically only in one out of five cases. Elasticity estimated with respect to cash is significant only in one case while it has got positive sign for four cases out of five. Positive sign for cash elasticity implies that with the increased demand for cash, farmers sell a large amount of produce. This seems to be true in present situation with the passage of time, there occurs a upward rise in the demand for cash due to inflationary trends or due to economic advancement. In order to fulfil their cash needs farmers are forced to sell larger quantities of their produce. Thus, these empirical results lend support to the hypothesis of positive relationship between marketable surplus and cash-requirement.

In the second exercise, we have estimated the total elasticity of marketable surplus with respect to output. An important property of the curve is that it has the same constant value of elasticity at every point of estimated line. Main features of the output elasticities are as follows:

(i) Co-efficients of correlation and regression are positive and highly significant. As high as 55 to 92 percent of total variations in sales of different commodities are explained by changes in output.

(ii) Output elasticity is not only positive but it is greater than unity in case of wheat, pulses and all food-grains which means that marketable surplus responds more than proportionately to changes in output.

(iii) In case of income, coefficient of correlation is significant in one out of five cases. But changes in income account for only 11 percent of total variations in marketable surplus.

(iv) Income elasticities have got the positive sign as expected. Elasticity happens to be significant in one case out of five. In case of rice, maize and all food-grains elasticity is quite high and reaches near to unity which means that marketable surplus respond less than proportionately to changes in income.

(v) Thus, output is more important determinant of marketable surplus of different commodities than income so far as sales behaviour of all farmers taken together is concerned. Hence, income does not emerge as important determinant as output. It is implicit that income is comprised of farm and non-farm income. A large part of total income is derived from other sources than agricultural income. If only farm income is taken into account then the situation will be different. In case of data collected from NSS reports, we have tried to calculate the elasticity of marketable surplus indirectly. If one has estimates of income and price elasticities of consumption, elasticity of marketable surplus could be derived by the following formula:

$$M = -(\beta - \alpha)\frac{q_f}{O_f - q_f} \qquad \ldots.(1)$$

We find that price elasticity from panel data is -.598 and it lends an empirical support to the hypothesis of inverse relationship between price and marketable surplus.

In bivariate analysis, cash requirements and income have not emerged as significant determinant of sales behaviour of farmers. Therefore, we have not tried to estimate the elasticity for marketable surplus with multiple regression analysis. Thus , bivariate regression results lend support to following hypothesis:

(i) Cash requirements and marketable surplus are positively related due to inverse relationship between price and marketable surplus. Inverse relationship between the two is free of the assumption of fixity of cash requirements.

(ii) Marketable surplus is positively and highly related with output/income. The change in both the variables emerges in the same direction.

These results are in consonance with the results of Punjab data. In the study of Sunher village, we found positive and significant relationship between marketable surplus and output/income. In both the studies, output emerges as an important determinant of marketable surplus. Even these results are similar to those of Tripathi (44). In her study, output/income are positively related with marketable surplus. In both the studies marketable surplus is also regressed on cash-requirements. Results are similar in both the studies. But the only significant difference between the two is that in her study, for most of the families cash-requirements are found to be negatively growing, while in the present study, we find that for all the thirteen families, cash requirements are positively growing.

CHAPTER-VII

CONCLUSIONS

(A) Estimated regression equations of consumption for all food-grains from NSS data reveal these features:

(i) Consumption curve for all food-grains is positively sloped.

(ii) Total expenditure exerts a much greater degree of influence than price. Positive expenditure elasticity happens to be larger than negative price elasticity which makes the consumption curve upward sloping.

(iii) Cross price elasticity happens to be statistically non-significant. However, its statistical non-significance reveals that this variable does not explain much of the changes in consumption.

(iv) Another feature of these results is that removal of other prices does not affect either the sign or statistical significance of the price and expenditure elasticities. This shows that prices of other goods are statistically superfluous explanatory variable so far as consumption of food-grains is concerned.

(B) Estimated equations for consumption for all the five commodities from Haryana data reveal the following features:

(i) Consumption curves for all the five commodities are positively sloped.

(ii) Income happens to be more important determinant of the shape and location of consumption curves.

(iii) An interesting point of these results is that with the substitution of expenditure for income, results are affected both qualitatively as well as quantitatively in all the cases except in case of all food-grains. The reason for such a difference seems to be that in Haryana agricultural output does not seem to have been immunised to the adverse weather conditions as it has been in Punjab.

(iv) Above results imply that consumption behaviour of farmers has not changed either qualitatively or quantitatively in post-green revolution period which is known as a period of high output and high level of development. There occured a positive growth in income and expenditure. But it appears to us that farmers have given due importance to requirements of growth. They consider food-grains as superior commodity. If, however, their efforts at development of agriculture continue consistently for a few years, it may be possible for them to raise their consumption level sufficiently and diversify its structure adequately in future. But the development so far has not been sufficient to lift the middle and small farmers out of poverty trap so far as their consumption behaviour is concerned.

(C) Main features (of the results) of estimated elasticities of marketable surplus from Punjab and Haryana data are as follows:

(i) Size is not a decisive determinant of marketable surplus. If there is any influence of size on marketable surplus, it is not direct. It might be exercising its influence via income/output.

(ii) Consumption levels of small and medium farmers are low, so any rise in output raises only their consumption rather than augmenting the sales for market. So inducement or incentives in the form of higher prices will not affect their sales behaviour so long as their pent up demand is not satisfied adequately.

(iii) These results lend empirical support to the hypothesis of positive relationship between marketable surplus and output/income.

(iv) Another important implication of these results is that if one wants to enlarge the size of marketed surplus either for building buffer-stocks, or for meeting ever increasing urban demand for food-grains or to keep the price fluctuations within the limits during the periods of shortages, efforts and inducements should be directed towards medium and large farmers as small farmers contribute very inconsequential if not negligible share of total marketable surplus.

(v) Output is more important determinant of marketable surplus of different commodities than income so far as sales behaviour of all farmers taken together is concerned. It is implicit that income is comprised of farm and non-farm income. A large part of total income is derived from other sources than agricultural sources. Hence, incentives and inducements to raise output or income whatever be their form, are the means through which market arrivals can be raised largely.

(D) Main features of the calculated rate of growth of different variables and sign test are as follows:

(i) Output, marketable surplus and cash-requirements have grown positively for all the families. Increase in output reflects higher income and higher level of development. Change in output and marketable surplus emerge in the same direction.

(ii) Sign test applied on the rate of growth of cash-requirements and marketable surplus provide empirical support to the hypothesis of positive relationship between the two variables.

(iii) Positive sign for the association of output/income and marketable surplus lend support to the hypothesis of positive relationship between dependent and independent variables.

APPENDIX-A
ELASTICITY OF CONSUMPTION

Empirical results derived from time series data are tabulated in tables II to VI. Main features of the estimated equations for all the five commodities are as follows:

I. All Food-grains:

(i) Co-efficient of multiple correlation is significant statistically in eight out of thirteen cases. Total variations explained by these equations are as high as .76 to .93.

(ii) Consumption curves are positively sloped in eight out of thirteen cases. In four cases, consumption curve is positive because positive income effect is larger than price effect; while in other four cases, it is because of larger and positive price effect.

(iii) Four out of thirteen income elasticities are also significant statistically. Five of the thirteen price elasticities are significant. Besides, both income and price elasticities are significant only in two cases. Only one of the two elasticities is significant in other cases.

(iv) Twelve income elasticities have got the positive sign as expected. Eight out of thirteen price elasticities have got the negative sign as expected a priori.

(v) When expenditure is substituted for income, coefficients of multiple correlation are significant in seven out of thirteen cases. These two variables account for as high as 78 to 97 percent of total variation in consumption.

(vi) Consumption curves are positively sloped in eight out of thirteen cases.

(vii) Eleven out of thirteen expenditure elasticities have got positive sign and seven price elasticities have got negative sign. Three expenditure elasticities are significant while price elasticity is significant statistically only in one case.

(viii) Consumption curves are positively sloped in five out of eight cases because positive expenditure elasticities are greater than price elasticities. But in two cases, the slope is positive because price effect itself is positive. For the sixth family, negative price effect is totally swamped by positive income/expenditure effect. So, the overall slope is positive. Thus, all food-grains are considered as a superior commodity by most of the households.

II. Wheat:

Wheat constitutes the staple diet of the farmers. A large chunk of total food-expenditure is spent on wheat.

Generally, it is considered a superior commodity by the farmers. We expect the behaviour pattern of Haryana farmers to follow the same pattern.

(i) Coefficients of multiple correlation are significant statistically in five out of thirteen cases. These equations explain as high as 69 to 90 percent of total variation in consumption of wheat.

(ii) Ten income elasticities are positive. Seven out of thirteen price elasticities have got negative sign. Three price and four income elasticities are significant statistically. Only in two cases, both income and price elasticities are significant. While, in rest of the cases, only one of the two elasticities is significant.

(iii) Consumption curves happen to be positively sloped in four out of thirteen cases. In two cases out of four, positive slope is because positive income effect is larger than the price effect, while in other two cases, this is due to larger value of positive price elasticity.

(iv) Expenditure as a substitute of income alters the results both qualitatively as well as quantitatively in few cases. Coefficients of multiple correlation are significant in five cases. Price and expenditure account for 69 to 89 percent of total variation in consumption.

(v) Seven price elasticities have got negative sign and eleven expenditure elasticities have got positive sign. Only one expenditure and one price elasticity is significant statistically. So in case of expenditure, significant price and income elasticities happen to be non-significant.

(vi) Consumption curves happen to be positively sloped in seven out of thirteen cases. In four cases, this slope is because of larger positive price effect, while in other cases, this is due to larger and positive expenditure effect. In two cases, negative price effect is totally swamped by positive expenditure effect. So wheat is considered a superior commodity by farmers.

III. Rice:

Wheat constitutes the staple diet of the farmers, while rice is consumed once in a while. Rice is generally considered as a commercial crop. So it is expected that consumption behaviour of farmers will be different from that related to other cereals, etc.

(i) Co-efficients of multiple correlation are significant in five out of thirteen cases. In case of rice, total variation explained by these variables are as high as 84 to 93 percent.

(ii) Income elasticity has got positive sign in seven cases. Eight out of thirteen price elasticities are negative. Income elasticity is significant statistically in four cases, while price elasticity is significant only in two cases.

(iii) Consumption curves are positively sloped in five cases. This slope occurs due to positive and larger income effect in four cases while in one case it is - because of larger price effect. Thus, rice is considered as a superior commodity by the farmers.

(iv) With the substitution of expenditure for income, coefficients of multiple correlation are significant statistically in three cases. Two variables account for as high as 79 to 90 percent of total variation in consumption of rice.

(v) Ten expenditure elasticities have got positive sign as expected. As on a priori reasoning, price elasticity has got negative sign in nine cases. Only one expenditure and one price elasticity is significant statistically. Results are affected both qualitatively as well as quantitatively with the substitution of expenditure for income.

(vi) Consumption curves are positively sloped in seven out of thirteen cases. In four cases, positive slope is because of larger and positive expenditure effect, while in other cases, this slope is due to larger and positive price effect which is strengthened by positive expenditure effect. So this commodity is treated as a superior commodity.

IV. Maize:

Main features of the empirical results in case of maize are as follows:

(i) Coefficients of multiple correlation are significant statistically in three out of eleven cases. As large as 77 to 94 percent of total variations are explained by these two variables.

(ii) Eight income elasticities have got positive sign while three price elasticities have got negative sign. Positive sign of price elasticity implies that with the increase in price, people consume more of that commodity. Generally, it is in case of superior commodities. Two price and one income elasticity are found to be statistically significant.

(iii) Consumption curves are positively sloped in six cases out of eleven. In three cases, it is because of higher and positive income effect, while in other three cases, it is due to higher and positive price effect.

(iv) With the replacement of income by expenditure, results are affected both qualitatively as well as quantitatively. Coefficients of multiple correlation are found to be significant in six out of eleven cases. They account for 82 to 96 percent of total variation in consumption of maize.

(v) Nine out of eleven expenditure elasticities are positive as expected. Three price elasticities are negative. Four price and three expenditure elasticities are significant statistically.

(vi) Slope of consumption curve is positive in six out of eleven cases. In all the cases, positive slope is because of larger and positive expenditure effect. So, maize is considered as a superior good.

(vii) Expenditure happens to be more decisive determinant than prices in case of maize. Even it happens to be better explanatory variable than income.

V. Pulses:

Main features of empirical results of pulses are as follows:

(i) Coefficients of multiple correlation are found to be significant statistically in seven out of thirteen cases. As high as 76 to 92 percent of total variation are explained by these two variables.

(ii) Nine income elasticities have got positive sign as expected. Nine price elasticities have got negative sign. Income and price elasticities are found to be significant statistically in three and two cases respectively.

(iii) Consumption curves are positively sloped in five cases. In three cases, slope is due to larger and positive income effect and in other two cases, this slope occurs because of positive and larger price effect.

(iv) If we substitute income by expenditure, coefficients of correlation are significant statistically in six out of thirteen cases. Total variation explained by these variables are as high as 79 to 95 percent.

(v) Eleven expenditure elasticities have got positive sign as expected and eight price elasticities have got negative sign as expected as a **priori.** Three price and two expenditure elasticities are significant statistically.

(vi) Consumption curves are positively sloped in nine out of thirteen cases. In six out of nine cases, this slope occurs due to larger positive expenditure effect. While in other three cases, this is because of larger and positive price effect. Thus, pulses are treated as superior commodity. These results are affected both qualitatively and quantitatively when expenditure is substituted for income.

APPENDIX-B

ELASTICITY OF MARKETABLE SURPLUS

Elasticities estimated from time-series data for each family separately for each commodity are given in Tables (10 to 14).

1. All Food-grains:

Bivariate regression analysis has been adopted in order to estimate elasticities of marketable surplus with respect to output, income and cash-requirements. Table(10) contains the results of all food-grains and this reveals the following features:

(A) Output:

(i) Coefficients of correlation between marketable surplus and output are significant statistically in ten out of thirteen cases. As high as 58 to 99 percent of total variation in marketable surplus are explained by changes in output.

(ii) Coefficient of regression is significant statistically in ten out of thirteen cases. In most of the cases elasticity is more than unity which means that with a change in output, there occurs a more than proportionate change in marketable surplus.

(B) Income

(i) Coefficients of correlation between marketable surplus and income are significant statistically in two out of thirteen cases only. Changes in income explain as high as 84 to 87 percent of total variation in sales behaviour of all food-grains.

(ii) Similarly, regression coefficients are also significant statistically only in two cases. But elasticity in most of the cases is less than unity. These results provide empirical support to the hypothesis of positive relationship between output/income and marketable surplus. Output happens to be an important determinant of sales behaviour of farmers than income.

(C) Cash-requirements:

(i) Coefficients of correlation between marketable surplus and cash-requirements are significant statistically in two cases. As high as 80 percent of total variation are explained with the change in cash-requirements.

(ii) Elasticity estimated with respect to cash-requirements has got positive sign for nine cases as expected. Thus, these results lend qualitative support to the hypothesis of positive relationship between cash-requirements and marketable surplus.

II. Wheat

Estimated elasticities are reported in Table (11). This table reveals the main features:

(A) Output:

(i) Coefficients of correlation between marketable surplus of wheat and output are significant statistically in all the thirteen cases. Output accounts for as high as 58 to 99 percent of total variation in the sales of wheat.

(ii) Coefficients of regression attached to output have got positive sign for all the thirteen cases, and are statistically significant.

(B) Income

(i) Coefficient of correlation between marketable surplus and income is significant statistically only in one case. Changes in income explain as high as 85 percent of total variation in the sales behaviour of wheat.

(ii) Coefficient of regression is significant only in one case. Eight out of thirteen income elasticities have got positive sign. Thus, output emerges as a more important determinant of marketable surplus.

(C) Cash-requirements

(i) Coefficients of correlation between marketable surplus and cash-requirements are significant statistically only in two cases. Cash-requirements explain as high as 77 to 80 percent of total variation in marketable surplus.

(ii) Cash-elasticities are significant only in two cases. Eight cash-elasticities have got positive sign. Positive sign to cash elasticity implies that with the increase in the demand of cash, marketable surplus also tends to rise. Thus, these empirical results lend qualitative support to the hypothesis of positive relationship between marketable surplus and cash-requirements.

III. Rice:

Table (12) contains the estimated elasticities of marketable surplus with respect to different variables. These results reveal:

(A) Output:

(i) Coefficients of correlation between marketable surplus and output are significant statistically for all the cases. Changes in output of rice explain as high as 76 to 99 percent of total variation in marketable surplus.

(ii) All regression parameters attached to output have got positive sign as expected and all are highly significant statistically.

(B) Income

(i) Coefficients of correlation between marketable surplus and income are significant in only three out of eleven cases. Income explains as high as 89 percent of total variation in marketable surplus.

(ii) Regression parameters are significant only in three cases and are positive in ten out of eleven cases. Their value in most of the cases is near to unity or more than unity. But non-significance of the estimated parameter makes output a more important determinant of marketable surplus than income.

(C) Cash-requirements:

(i) Coefficients of correlation between marketable surplus and cash are significant only in two cases out of eleven. Changes in cash-requirements account for as high as 74 percent of total variation.

(ii) Regression parameter attached to cash are significant only in three cases. These parameters are positive in seven cases as expected on a priori. Empirical results provide qualitative support to the hypothesis of positive relationship between marketable surplus and cash.

IV <u>Maize</u>

Table (13) reveals the main features of estimated elasticities with respect to different variables.

(A) <u>Output</u>:

(i) Seven out of eight coefficients of correlation are significant statistically. These explain as high as 99 percent of total variation in marketable surplus of maize.

(ii) All the regression parameters attached to output are highly significant statistically and are more than unity in most of the cases which implies that marketable surplus responds more than proportionately to changes in output.

(B) <u>Income</u>

(i) None of the coefficient of correlation is found to be significant statistically. Eight income elasticities are positive as expected. Thus, these provide qualitative support to the hypothesis of positive relationship between marketable surplus. Hence, income does not emerge at all significant determinant in case of maize.

(C) Cash-requirements:

(i) Coefficient of correlation between marketable surplus and cash-requirements is significant only in one case. This explains 76 percent of total variation in marketable surplus.

(ii) Six cash-elasticities have got positive sign. Positive sign with non-significance of the parameter only provide qualitative support to the hypothesis of positive association between marketable surplus and cash-requirements.

V. Pulses

Table (14) containing the empirical results of pulses reveals:

(A) Output

(i) Coefficients of correlation are significant statistically in all the eleven cases. They account for as high as 83 to 99 percent of total variation in marketable surplus of pulses.

(ii) Elasticities attached to output are significant in all the cases. Output elasticities have got positive sign as expected in all the cases. Elasticity is more than unity in few cases. It implies that marketable surplus is more responsive to output that any other explanatory variable.

(B) <u>Income</u>

(i) Coefficient of correlation between marketable surplus and income and regression parameter attached to income are significant statistically only in two cases. The values of coefficient of correlation explain as high as 83 to 86 percent of total variation in market arrivals of pulses.

(ii) Seven out of thirteen income elasticities are positive. But due to non-significance in most of the cases, income does not emerge as a significant determinant of marketable surplus.

(C) <u>Cash-requirements</u>:

(i) Coefficient of correlation is significant only in two cases. Cash account for 75 percent of total variation in marketable surplus.

(ii) In most of the cases, parameters attached to cash have got negative sign. Thus, output emerges as the most important determinant of the marketable surplus.

Output alone accounts for the large variation in marketable surplus. Hence, for all the cases, output is more important determinant of the sales behaviour of farmers than income or cash-requirements. The plausible reason seems to be that income of the farmers is derived from various sources and a large part of it is derived from the sources other than farm cultivation. As agriculture does not provide them adequate base for income, so they depend on the subsidiary sources of income. If only farm income is considered, then it may emerge as a perfect substitute of output for the determination of marketable surplus.

TABLE-I

SIZE OF HOLDINGS AND INCOME OF SAMPLED FAMILIES

District	Sr. No.	Family	Average size of Holding (hectares)	Average Per Capita Income Rs.
Ambala	1.	Khera	11.27	1436.89
"	2.	Sarwan II	5.32	846.31
"	3.	Sular	5.95	760.95
Karnal	4.	Hathwala II	5.53	903.95
"	5.	Jamba II	7.10	1666.63
"	6.	Mohna I	3.81	963.70
"	7.	Kandela	5.36	1072.95
Rohtak	8.	Bidhlan I	5.01	1469.05
"	9.	Bighan I	4.88	1319.71
"	10.	Kheri Meham	4.09	1307.63
"	11.	Raipur I	1.95	634.08
Hissar	12.	Bhattu-Kalan-I	6.85	1791.25
Gurgaon	13.	Badah I	10.37	718.75

TABLE-2

ELASTICITIES OF CONSUMPTION OF ALL FOOD-GRAINS

Sr. No.	Intercept	Price	Income	R	Intercept	Price	Exp.	R
1	2	3	4	5	6	7	8	9
1.	3.58415	-1.06427*	.25513*	.91933*	3.36446	-.92289	.22633	.82424*
		(-3.08201)	(2.5238)			(-1.79139)	(1.23466)	
2.	.55933	-.017503	.53131	.64891	-2.59185	.16833	1.58518*	.902139*
		(-.01879)	(1.03237)			(.36104)	(3.10554)	
3.	3.92079	-1.76638*	.55772	.88286*	-2.13586	-.96347	.66542	.90477*
		(-3.22722)	(1.63850)			(-1.87572)	(1.97789)	
4.	3.65514	-4.46858	2.66597*	.87705*	-1.01178	.85091	.50043	.64481
		(-1.793104)	(2.73638)			(.45409)	(1.06956)	
5.	3.61069	-.15825	-.32617	.09392	6.50820	-.54774	-1.06779	.43045
		(-.074728)	(-.15909)			(-.33449)	(-.82497)	
6.	-.27941	-.33591	.98953	.75512*	1.29348	-.42945	.56339	.72287
		(-.32442)	(1.37751)			(-.39617)	(1.18689)	
7.	1.78623	-.17062	.20179	.73708	.36376	.25875	.408691	.78749*
		(-.73462)	(1.30733)			(.66539)	(1.63197)	
8.	.53487	.34308*	.33573	.82852*	-.59796	.46167*	.63347*	.97722*
		(2.41931)	(1.11901)			(7.74351)	(5.15783)	
9.	.81606	.25755	.24609	.40734	1.08287	-.32263	.58012	.26341
		(.27098)	(.77226)			(-.27055)	(.47253)	
10.	-3.94960	.79429	1.37214	.63185	-1.25331	.69050	.59204	.44606
		(.65228)	(1.36531)			(.48977)	(.80498)	

Contd...

Table-2 Contd...

1	2	3	4	5	6	7	8	9
11.	2.39647	-.56396*	.27792	.83606*	3.70836	-.67655	-.10362	.79249*
		(-2.18381)	(.89642)			(-1.98119)	(-.27947)	
12.	-9.11099	4.15521	.92945*	.76918*	-6.40008	2.11528	1.45978*	.86391*
		(1.04909)	(1.99876)			(.67564)	2.77409	
13.	-5.42538	2.40427*	.92744*	.93084*	2.77033	-.51169	.10324	.54204
		(2.86689)	(3.61417)			(-1.04115)	(.19699)	

TABLE-3

CONSUMPTION ELASTICITY OF WHEAT

Sr. No.	Intercept	Price	Income	R	Intercept	Price	Exp.	R
1	2	3	4	5	6	7	8	9
1.	1.22741	.11519	.18373	.45522	1.78725	1.13636	.54066	.69733*
		(.13622)	(.87577)			(.15342)	(.32235)	
2.	6.2082	-1.3504*	-.61879	.79637*	2.50488	-.71111	.24121	.63875
		(-2.2757)	(-1.39537)			(-1.04494)	(.23940)	
3.	4.0525	-1.64445	.316223	.66451	.47952	-.47045	.80381	.80223*
		(-1.48526)	(.63851)			(-.42170)	(1.5294)	
4.	4.4444	1.43609	1.24253*	.88316*	5.23159	2.58603*	.80482*	.88784*
		(1.11843)	(2.89031)			(2.03844)	(2.96628)	
5.	1.18029	.45763	-.01875	.36412	.22069	.70959	.13566	.43365
		(.51896)	(-.06039)			(.81957)	(.45699)	
6.	4.2175	-3.12911*	1.23813*	.90019*	4.16142	-2.09949	.66667	.77874*
		(-2.10829)	(2.82379)			(-.92411)	(1.51210)	
7.	2.20104	.99143	.73024*	.82285*	1.35819	-.05442	.24680	.34566
		(1.07753)	(2.48731)			(-.04132)	(.60595)	
8.	2.52846	.348602*	-.69726*	.86212*	1.82087	.61232	-.30275	.73166
		(2.90790)	(1.80559)			(1.76567)	(-.67755)	
9.	2.06896	-.074918	.01848	.04089	2.09964	-.04996	-.00782	.02577
		(-.061213)	(.05566)			(-.04383)	(-.00523)	

Contd...

Table-3 Contd...

1	2	3	4	5	6	7	8	9
10.	3.57117	.62109	1.37371	.55994	3.83235	1.37731	.99704	.54013
		(.40574)	(1.16337)			(.74382)	(1.10431)	
11.	2.28136	-.59467	.27829	.484052	3.01675	-1.08498	.35941	.56815
		(-.51812)	(.53552)			(-1.04964)	(.84632)	
12.	3.3915	-1.47405	.46289	.71613	.12555	.77779	1.15332	.86170*
		(-.37046)	(.43840)			(-.42659)	(1.74355)	
13.	1.93880	-.23614	.17374	.68517*	2.47498	-.80156	.39683	.58468
		(-.38446)	(1.14771)			(-1.23678)	(.69294)	

TABLE-4

CONSUMPTION ELASTICITY OF RICE

Sr. No.	Intercept	Price	Income	R	Intercept	Price	Exp.	R
1	2	3	4	5	6	7	8	9
1.	1.29157	.32365	-.41108	.73698	-.42386	.30549	.15785	.71312
		(1.88853)	(-.49929)			(1.75572)	(.14317)	
2.	-6.34744	-.52379	1.29368*	.88755*	-6.4762	-1.34189	3.80401	.794594*
		(-.58563)	(2.32905)			(-1.34287)	(1.36049)	
3.	2.18669	.34635	-.73778	.64135	.86744	.30994	.86244	.61239
		(1.44772)	(-.49462)			(1.33017)	(.23688)	
4.	-7.96121	-4.96011*	6.65018*	.83540*	.32462	-2.03132	1.70917	.54291
		(2.52356)	(2.46752)			(-.98387)	(.94511)	
5.	2.31839	.14109	-.43222	.16003	12.18006	-.83005	-3.10428	.50737
		(.17834)	(-.17066)			(-.67572)	(-.98729)	
6.	1.87138	.24455	.78593	.54792	.638203	.08742	.06343	.13208
		(.74288)	(1.11047)			(.22973)	(.12207)	
7.	8.36944	-1.42192	-1.56595	.73744	.83499	.79523	.57531	.53989
		(-1.64138)	(-1.3358)			(-.51413)	(.28356)	
8.	-8.25974	-.31659	3.18290*	.90584*	-2.24384	-.96607	1.61713	.65574
		(-.49985)	(3.10260)			(-.93029)	(.98739)	
9.	4.74900	-1.30164	-.409668	.39820	16.23413	-.64836	-4.87145	.57499
		(-.67383)	(-.17050)			(-.45683)	(-.89870)	
10.	15.76687	-2.11506	-3.51269	.61401	7.38137	-1.58794	-1.20976	.46553
		(-1.21326)	(-1.07797)			(-.86387)	(-.55702)	

Contd...

Table-4 Contd...

1	2	3	4	5	6	7	8	9
11.	3.80131	-3.30814*	1.32651	.92703*	4.31589	-3.04366*	.94443	.89601*
		(-3.79302)	(1.62241)			(-2.76434)	(-1.00837)	
12.	-.61247	-2.30757	1.76660*	.90112*	-2.4066	-1.42309	1.93178*	.88432*
		(-1.59496)	(2.79339)			(-1.10944)	(2.52078)	
13.	-2.94039	.69443	.67732	.44639	-5.85154	.46775	1.981245	.45024
		(.62275)	(.86255)			(.50516)	(.87190)	

TABLE-5

CONSUMPTION ELASTICITY OF MAIZE

Sr. No.	Intercept	Price	Income	R	Intercept	Price	Exp.	R
1	2	3	4	5	6	7	8	9
1.	1.47754	-1.37986	.81974	.60434	4.41493	-4.08993*	1.78743*	.84636*
		(-.46716)	(.95077)			(-2.09688)	(2.40299)	
2.	-1.06634	.08035	.81475	.61285	-5.59395	.54231	2.18470	.70222
		(.06512)	(1.05488)			(.43758)	(1.47389)	
3.	17.11877	-6.71023	-.73538	.73548	11.01187	-4.94517	.10949	.58633
		(-1.79584)	(-1.14354)			(-1.01645)	(.11625)	
4.	1.87550	-.88059	.44596	.19693	6.65727	-6.13636*	3.00128*	.84970*
		(-.34739)	(.24759)			(-2.70658)	(2.75404)	
5.	-3.02703	.48685*	.94373	.93129*	.15559	.48600*	-.05117	.91509*
		(4.35618)	(.82399)			(3.92590)	(-.04939)	
6.	-.47478	.22033	.17789	.41672	-3.48629	.06657	1.37387	.62932
		(.66702)	(.07723)			(.22562)	(1.05488)	
7.	.26809	.03005	-.08936	.76886*	.39893	.02634	-.13947	.84818*
		(1.69385)	(-.79689)			(1.75241)	(1.51484)	
8.	-.08214	.18186	.03144	.48969	-1.22459	.202281	.39767	.51845
		(.88525)	(.02501)			(1.04849)	(.34587)	
9.	-3.48165	1.88374	.30196	.63720	-9.26131	1.84264*	2.32706*	.96287*
		(1.33761)	(.69689)			(3.77073)	(5.04048)	
10.	-	-	-	-	-	-	-	-
		-	-			-	-	

Contd...

Table-5 Contd...

1	2	3	4	5	6	7	8	9
11.	4.6604	.20293	-1.65100	.70303	6.17836	.26368	2.21581	.81950*
		(1.00504)	(-.77285)			(1.82051)	(1.59358)	
12.	-	-	-	-	-	-	-	-
		-	-			-	-	
13.	5.36851	.47963*	1.81351*	.94250*	-5.86162	.12645	2.21807	.59194
		(4.65684)	(4.27345)			(.66277)	(.80970)	

TABLE-6

CONSUMPTION ELASTICITY OF PULSES

Sr. No.	Intercept	Price	Income	R	Intercept	Price	Exp.	R
1	2	3	4	5	6	7	8	9
1.	-2.86768	.79231	.64594*	.79385*	-1.57659	.93592	.14415	.27309
		(.30777)	(2.14152)			(.46736)	(.17749)	
2.	8.70404	-1.89375	-1.52061	.60823	-6.12231	-1.47698	3.51774	.65572
		(-1.12151)	(-.87075)			(.92422)	(1.07422)	
3.	2.08314	-1.33573	.43853	.69002	.74476	-.87989	1.19389	.79286*
		(-1.55003)	(.45635)			(-1.06913)	(1.23516)	
4.	2.05910	-3.25662	1.72123*	.91625*	6.89140	-4.14792	.97784*	.83057*
		(-1.49706)	(3.58709)			(-1.46298)	(2.28253)	
5.	12.39214	-3.95237*	-1.00405	.92459*	9.39622	-4.64365	.41849	.90266*
		(-3.15776)	(-1.10261)			(-3.63100)	(.55081)	
6.	-1.66083	.38284	.58806	.80914*	-.63619	.41255*	.24361	.80188*
		(1.93847)	(.45608)			(2.23991)	(.32093)	
7.	6.95500	-2.35655*	-.06741	.88960*	10.78216	-3.65717*	-.81516	.94672*
		(-3.35588)	(-.12448)			(-4.84293)	(1.75054)	
8.	.21573	.16632	-.05596	.02002	.46041	.92391	-.61914	.22410
		(.03448)	(-.02555)			(.26227)	(-.39755)	
9.	-2.20840	.69011	.37723	.76186*	-3.09293	.79537	.62681	.68996
		(.99798)	(.97307)			(.87524)	(.40069)	
10.	-6.21800	-.91451	2.70791*	.75529*	-1.01893	-.60712	.85659	.39694
		(-.99290)	(2.0000)			(-.47198)	(.70354)	

Contd...

Table-6 Contd...

1	2	3	4	5	6	7	8	9
11.	-.64212	-.55235	.62148	.43958	-12.74436	.35104	4.12053	.75389
		(-.57888)	(.22375)			(.43371)	(1.64337)	
12.	.52196	-.36247	.31904	.52109	-.21723	-.37488	.60797	.65047
		(-.37497)	(.72176)			(-.46276)	(1.20251)	
13.	1.88021	-1.32565	.42072	.73287	-1.61176	-1.38118*	2.13666*	.80635*
		(-1.42391)	(.85606)			(-2.25582)	(2.39278)	

TABLE-7

Output and Marketable - Surplus Per. household.

Size group	Income per household (Rs)	Output per household	Marketable surplus per house-hold.	Proportion of sales to output
			Wheat	
1-5 hectare	6974.42	41.00	29.14	71%
5-10 hectare	13642.85	76.91	58.29	75.79%
10-20	19986.11	121.97	97.81	80.19%
20-60	50781.75	243.43	197.81	81.59%
TOTAL	17191.39	94.96	74.19	78.13%
			Paddy	
1-5 hectare	6974.42	46.81	40.16	85.79%
5-10 hectare	13642.85	79.91	75.49	94.47%
10-20	19986.11	139.78	133.16	95.26%
20-60	50781.75	322.25	316.44	98.197%
TOTAL	17191.39	108.26	104.71	96.72%
			All Food-grains	
1-5 hectare	6974.42	81.12	67.26	82.19%
5-10 hectare	13642.85	155.02	135.11	87.16%
10-20	19986.11	266.19	229.97	86.39%
20-60	50781.75	580.19	527.44	90.91%
TOTAL	17191.39	205.53	197.97	96.32%

TABLE-8

REGRESSION AND CORRELATION COEFFICIENTS OF OUTPUT, INCOME, SIZE OF HOLDING AND MARKETABLE SURPLUS

Group	Wheat Output			Paddy Output		Wheat Income
	Intercept		Intercept		Intercept	
1.	-.1784	1.015	.01364	.8987	-2.1844	.918
2.	-.1769	1.0269	.0427	.9264	2.863	.4932
3.	-.0882	.9965	-.06157	1.0377	2.8032	.5710
4.	-.0787	.9921	-.01740	1.0049	3.449	.1353

Group	Paddy Income			Wheat $\frac{M}{O}$ and Size		Paddy $\frac{M}{O}$ and Size
1.	2.6312	.5658	.02009	.28902	.5667	.25746
2.	2.7947	.5053	1.0425	-.08128	-.9147	.01288
3.	2.7091	.5956	.76168	.27144	-1.2165	.43076
4.	3.0895	.3463	2.6579	-.63203	-3.5166	2.4998

TABLE-9

RELATIVE SHARE OF DIFFERENT GROUPS

Size Group	Wheat: Relative Share in Sales	Wheat: Relative share in Output	Paddy: Relative share in Sales	Paddy: Relative share in Output
(I) 1-5 Hectare	10.946	12.46	10.58	11.323
(a) 1-2 Hectare	0.44	0.51	0.550	0.62
(b) 2-3 "	2.36	2.87	4.005	4.217
(c) 3-5 "	8.19	9.08	6.025	6.486
(II) 5-10 "	28.99	29.93	27.16	27.42
(III) 10-20 "	30.85	29.68	28.697	28.68
(IV) 20-60 "	29.20	27.91	33.556	32.56

TABLE-10

ELASTICITIES OF MARKETABLE SURPLUS OF ALL FOOD-GRAINS

Sr. No.	Intercept	Output Elasticity	R	Intercept	Income Elasticity	R	Intercept	Cash requirement Elasticity	R
1	2	3	4	5	6	7	8	9	10
1	-.771	1.213* (24.606)	.997*	2.028	.249 (.423)	.207	2.355	.162 (.179)	.089
2	-.261	1.041* (53.752)	.999*	-.078	.947 (3.056)	.837*	1.067	.567 (1.217)	.520
3	-.628	1.175* (12.990)	.988	2.322	.124 (.280)	.139	1.200	.586 (.884)	.404
4	-1.983	1.621* (5.387)	.937*	-2.824	1.819 (1.492)	.598*	-1.028	1.398* (2.546)	.786*
5	-.589	1.148* (2.334)	.759*	3.961	-.287 (-.853)	.392	3.416	-.121 (-.193)	.096
6	-.305	1.066* (18.393)	.994*	.308	.852 (1.545)	.611*	1.113	.668 (1.322)	.551
7	.344	.797* (2.224)	.743*	2.358	.024 (.105)	.052	2.462	-.012 (-.046)	.023
8	.448	.772 (1.608)	.626*	3.684	-.322 (.940)	.425	2.542	.049 (.154)	.076

Contd..

Table-10 Contd...

1	2	3	4	5	6	7	8	9	10
9	-.348	1.061*	.964*	-.397	.997*	.873*	3.295	-.246	.164
		(7.233)			(3.577)			(-.333)	
10	1.241	.532	.578*	-.387	.999	.669	2.066	.229	.306
		(1.419)			(1.799)			(.643)	
11	12.826	6.342*	.956*	-17.239	6.698	.516	-4.852	2.55	.418
		(6.508)			(1.205)			(.921)	
12	-1.839	1.582	.478	3.287	-.348	.169	6.409	-1.610	.158
		(1.089)						(-.319)	
13	-.761	1.217*	.993*	2.318	.050	.066	-1.550	1.595*	.794*
		(16.807)			(.133)			(2.612)	

TABLE-11

ELASTICITY OF MARKETABLE SURPLUS OF WHEAT

Sr. No.	Intercept	Output Elasticity	R	Intercept	Income Elasticity	R	Intercept	Cash requirement Elasticity	R
1	2	3	4	5	6	7	8	9	10
1	-9.06455	4.013* (7.231)	.964*	6.408	-1.572 (-.361)	.178	4.331	-1.016 (-.153)	.076
2	.76327	1.237* (13.288)	.989*	1.078	1.160 (1.489)	.597	1.235	.374 (.408)	.200
3	-.52168	1.149* (16.203)	.992*	2.218	.107 (.186)	.093	.158	.940 (1.159)	.501
4	.60515	1.129* (5.161)	.932*	-1.399	1.300 (1.274)	.537	-.337	1.087* (2.404)	.769*
5	-.64054	1.176* (34.938)	.998*	.421	.758 (1.201)	.515	3.441	-.223 (-.368)	.181
6	-.30926	1.061* (9.714)	.979*	-.047	.851 (1.513)	.603	1.049	.554 (1.013)	.452
7	-1.04156	1.322* (5.117)	.931*	3.064	-.238 (-.590)	.283	1.200	.449 (1.043)	.462
8	-.56794	1.129* (3.246)	.851*	4.019	-.450 (-1.466)	.591	.281	-.074 (-.229)	.114

Contd..

Table-11 Contd..

1	2	3	4	5	6	7	8	9	10
9	-.88780	1.266*	.980*	-.318	.949*	.850*	3.665	-.420	.288
		(9.963)			(3.227)			(-.601)	
10	1.39451	.478	.579*	-.412	1.006	.694	1.933	.272	.574
		(1.419)			(1.925)			(.808)	
11	10.64635	5.438*	.963*	-13.318	5.317	.499	-3.584	2.067	.413
		(7.158)			(1.153)			(.906)	
12	7.18409	3.590*	.765*	5.994	-1.306	.385	26.799	-.951	.567
		(2.375)			(-.835)			(-.138)	
13	-.75030	1.215*	.994*	2.290	-.056	.078	-1.597	1.611*	.804*
		(18.509)			(.155)			(2.700)	

TABLE-12

ELASTICITY OF MARKETABLE SURPLUS OF RICE

Sr. No.	Intercept	Output Elasticity	R	Intercept	Income Elasticity	R	Intercept	Cash requirement Elasticity	R
1	2	3	4	5	6	7	8	9	10
1	.0004	.976*	.999*	-3.511	1.746	.414	-10.922	4.636*	.730*
		(60.725)			(.911)			(2.136)	
2	.099	1.005*	.994*	-.129	.866	.606	-.505	1.021*	.741*
		(18.229)			(1.524)			(2.206)	
3	.318	.949*	.981*	1.818	.065	.061	2.730	-.289	.166
		(10.203)			(.121)			(-.337)	
4	-.034	.957*	.989*	-.903	.801	.467	.141	.515	.514
		(13.902)			(1.056)			(1.197)	
5	-.475	1.140*	.984*	-3.188	1.826*	.886*	3.077	-.153	.089
		(10.945)			(3.815)			(-.178)	
6	-.105	1.014*	.999*	.119	.832	.604	.675	.742	.620
		(100.05)			(1.518)			(1.579)	
7	-.946	1.230*	.760*	-7.185	2.522	.317	-1.762	.839	.092
		(2.336)			(.669)			(.183)	
8	-.007	.866*	.947*	4.680	-1.060	.307	-2.030	1.269	.429
		(5.866)			(-.646)			(.952)	

Contd...

Table-12 Contd..

1	2	3	4	5	6	7	8	9	10
9	-.172	1.049* (44.798)	.999*	-3.148	1.552* (2.277)	.751*	-.604	.899 (.705)	.332
10	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-
12	-	-	-	1.310	.397* (2.257)	.749*	.794	-.325 (-.249)	.124
13	-	.536* (14.29)	.999*	-.484	.202 (.597)	.286	.938	-.341 (-.367)	.180

TABLE-13

ELASTICITY OF MARKETABLE SURPLUS OF MAIZE

Sr. No.	Intercept	Output Elasticity	R	Intercept	Income Elasticity	R	Intercept	Cash requirement Elasticity	R
1	2	3	4	5	6	7	8	9	10
1	-1.284	1.544*	.999*	9.390	-2.546	.426	.816	-2.416	.268
		(38.306)			(-.942)			(-.557)	
2	-1.744	1.303*	.773*	-7.099	2.362	.279	4.132	-1.537	.188
		(2.441)			(.580)			(-.383)	
3	-2.122	1.778*	.846*	-4.149	1.476	.176	13.015	-5.150	.378
		(3.171)			(.358)			(-.817)	
4	-4.750	2.974*	.837*	-13.463	5.010	.575	-8.584	3.877*	.761*
		(3.057)			(1.405)			(2.347)	
5	.0371	.900*	.933*	8.386	-2.173	.666	-3.507	1.863	.684*
		(5.194)			(-1.786)			(1.874)	
6	-.352	.848	.692*	-2.970	1.026	.184	2.071	-.771	.159
		(1.918)			(.374)			(-.321)	
7	-	-	-	-.402	.127	.447	-.404	.149	.457
					(1.000)			(1.026)	
8	-	-	-	1.648	-.525	.238	-2.195	.822	.435
					(-.490)			(.966)	

Contd...

Table-13 Contd...

1	2	3	4	5	6	7	8	9	10
9	-2.635	2.377* (3.482)	.867*	-2.415	1.081 (.728)	.342	2.756	-.733 (-.361)	.177
10	-	-	-	.035	-.019 (-.040)	.020	-.876	.283 (1.443)	.585
11	-	-	-	-7.515	2.625 (1.384)	.569	-2.764	1.043 (1.096)	.481
12	-	-	-	-	-	-	-	-	-
13	.186	.704* (1762.44)	1.000*	.830	.346 (.597)	.286	1.610	-.585 (-.387)	.180

TABLE-14

ELASTICITY OF MARKETABLE SURPLUS OF PULSES

Sr. No.	Intercept	Output Elasticity	R	Intercept	Income Elasticity	R	Intercept	Cash requirement Elasticity	R
1	.006	.883* (8.066)	.971*	-2.248	.952 (.809)	.375	8.040	-2.643 (-1.914)	.691
2	-.201	1.051 (3.386)	.861	4.351	-1.444 (-.700)	.330	8.768	-3.036* (2.086)	.722*
3	-1.139	1.665* (6.180)	.951*	-3.656	1.653 (1.731)	.654	-1.506	1.016 (.512)	.248
4	-.154	.949* (3.019)	.834*	.263	-.080 (-.051)	.025	.872	-.334 (-.369)	.182
5	-.997	1.375* (4.006)	.895*	-32.758	10.194* (2.997)	.832*	.273	-1.046 (-.205)	.102
6	-	-	-	2.157	-.889 (-.411)	.201	-.145	-.132 (-.069)	.034
7	-.953	1.318* (4.082)	.898*	-3.946	1.367 (.413)	.202	15.190	-5.869* (-2.278)	.751*
8	-.114	1.024* (6.134)	.951*	-8.441	2.761* (3.407)	.862*	.529	-.134 (-.098)	.048

Contd...

Table-14 Contd...

1	2	3	4	5	6	7	8	9	10
9	-	-	-	3.774	-1.305 (-.896)	.409	-7.152	2.756 (1.758)	.660
10	-.096	1.016* (6.967)	.961*	5.755	-1.773* (-3.379)	.166	8.000	2.602 (-1.116)	.487
11	-.068	1.010* (12.360)	.987*	-3.153	1.248 (.368)	.182	2.228	-.766 (-.488)	.236
12	-.533	1.234* (4.225)	.904*	-1.222	.340 (.170)	.085	-.152	.575 (.607)	.291
13	-.147	.994* (7.222)	.964*	3.581	-1.211 (1.584)	.621	-.143	.134 (.051)	.026

TABLE-15

RATE OF GROWTH AND SIGN TEST

Sr No.	I Income	II Expenditure	Output	Cash requirement	Marketable Surplus	Sign test C-M	Sign test O C	Sign test O-M
1.	2.336	1.928	2.180	1.857	2.087	+	+	+
2.	2.049	1.802	1.996	1.128	1.853	+	+	+
3.	2.128	1.900	1.826	1.724	1.672	+	+	+
4.	1.934	1.507	1.548	1.429	1.266	+	+	+
5.	2.087	1.903	2.107	1.792	2.001	+	+	+
6.	2.075	2.008	2.074	1.783	1.943	+	+	+
7.	2.131	1.700	1.616	1.352	1.434	+	+	+
8.	2.442	1.839	1.726	1.563	1.594	+	+	+
9.	1.941	1.877	1.628	1.472	1.356	+	+	+
10.	2.214	2.065	2.015	2.165	1.911	+	+	+
11.	1.890	1.764	1.182	1.299	0.822	+	+	+
12.	2.322	1.987	1.436	1.675	1.058	+	+	+
13.	1.989	1.635	1.950	1.658	1.830	+	+	+

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Abbreviations Used in Bibliography

1. AJAE — American Journal of Agricultural Economics.
2. ASI — Agricultural Situation in India.
3. EA — Economic Analyst.
4. EJ — Economic Journal.
5. EPW — Economic and Political Weekly.
6. EW — Economic Weekly.
7. IJAE — Indian Journal of Agricultural Economics.
8. JFE — Journal of Farm Economics.
9. NCER — National Council of Economic Research.
10. QJE — Quarterly Journal of Economics.
11. SPIESR — Sardar Patel Institute of Economic and Social Research.
12. TIJE: — The Indian Journal of Economics.