

An Estimation of the Demand Function of Wheat in Nepal

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The principal aim of this paper is to derive basic results of demand function of wheat in Nepal by using econometric techniques. To derive the results this analysis is based on time-series data from 1964/65 to 1977/78.

The paper is outlined as follows: Section I discusses the importance and production of wheat in Nepal. Objectives, hypothesis, and limitations are specified in section II, and estimated demand functions are presented in section III. Interpretation of the results and conclusion are contained in section IV.

In our country the first important crop is paddy, which occupies 60.7% of total cultivated area followed by maize (22.8) and wheat (13.9). Keeping aside the agricultural land in the hilly and Himalayan regions and taking into account the Terai belt only which is the grainery of the country, wheat is major crop next to paddy in terms of area and production. Considering the agricultural production as a whole, though wheat is the third important crop it is the second crop grown in the Terai and the first important winter crop though the farmers have been engaged in wheat cultivation for years, then intensive and systematic use of fertilizer, and improved techniques have only been recently introduced.

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15 years ago wheat was an important crop only in the far-western hills. Very little wheat used to be grown in Terai. However, after the introduction of the Mexican Dwarf variety in 1965/66 wheat area increased tremendously in Terai resulting in a threefold increase in the area under wheat cultivation in the country within a short period of time. Production also has gone up significantly, so more wheat is available for consumption as well as for export purposes. But export prospect of Nepalese wheat is not so bright. Therefore, most of the increased production would have to be consumed within the country. Due to the food habit of the Nepalese people wheat consumption is very low, however, the trend is changing slowly. Wheat is more nutritious and cheaper than rice and maize. If rice consumption could be curtailed and substituted by wheat more rice could be made available for export.

Wheat itself is the raw material for bakery, biscuits, and other similar industries. Increasing trend in wheat production and industrial facilities as well as urbanization has resulted in the establishment of many industries which used wheat as the primary raw material in some parts of the country within a short period of time. These industries provide job opportunities and to some extent solve the problem of unemployment. Wheat thus has become an important crop even to the small and poor farmers of the country. The present growth rate of population is 2.2 percent per year and the increased population have to be fed by more food producing. In view of inelastic supply of land, the only way to increase the production of wheat in the future is by introducing better technology, high yielding seeds and adequate irrigation facilities.

In recent years wheat cultivation is getting very popular among the farmers. Its production has increased primarily due to expansion in area. But the productivity has not increased. It is only 1.12 m. ton/ha. in average. At present wheat is being grown in 360 000 hectares, which is near about 15.5% of the total cultivated area of 23,26000 hectares.

The area under production, cultivation, Grain yield and percentage change in area and production during various years and price index of wheat are presented in Table 1.

Table I

Fiscal year	Area (in hectares) "000"	Production (in M.Ton) "000"	Grain yield M. Ton/ha	%change in area over years	%change in produ- ction over years	Price index
1964/65	100	126	1.26	-	-	100
65/66	118	147	1.25	+18.00	+16.67	117
66/67	126	159	1.26	+ 6.78	+ 8.16	106
67/68	192	205	1.07	+52.38	+29.93	173
68/69	208	233	1.12	+ 8.33	+13.66	111
69/70	226	265	1.17	+ 8.65	+13.73	112
70/71	228	193	0.85	+ 0.88	+27.17	103
71/72	239	223	0.93	+ 4.82	+15.54	119
72/73	259	312	1.20	+ 8.37	+39.91	164
73/74	274	308	1.12	+ 5.79	+ 1.28	176
74/75	291	331	1.14	+ 6.20	+ 7.47	222
75/76	329	387	1.18	+13.06	+16.92	179
76/77	348	362	1.04	+ 5.78	+ 6.46	155
77/78	360	401	1.11	+ 3.45	+10.77	179

Source: Agriculture statistics of Nepal, 1976 & 1977

Though area and production have increased significantly, average yield has not increased. Instead of showing an increasing trend, average yield has greatly declined. It might be due to the cumulative effect of the expansion of wheat cultivation into marginal and rain-fed area as well as big expansion of acreage in the Terai and erratic trend of price. To know the actual growth rate of area, production and price, growth rate "r" is calculated according to the compound growth rate method. The compound growth rate is;

$$Y = Ab^t$$

Where: $b = 1 + r$

& r = percentage growth rate.

Table - II

Compound growth rates of Area, Production, & Price of Wheat.

Particulars	A's value	b's value	Growth rate	(r) in %
Area	110.21946	1.0965373	9.65373	
Production	130.39517	1.0879451	8.79451	
Price	99.032762	1.0465845	4.65845	

Source- Table - I.

The growth rates of area and production seem more or less the same i.e; 9.7 % & 8.8 % respectively, while the growth rate of price is only 4.7 % within the fourteen years period. By taking into account the price of wheat, its cultivation has become less profitable, because chemical fertilizer as well as agricultural inputs' prices have increased significantly, but the product price has not increased sufficiently. So it has created a great problem for the farmers. Beside this, other difficulties faced by the farmers are lack of marketing, infrastructure, and export market.

II The analysis of function for wheat in Nepal was done with the following objectives:

- (i) To estimate the aggregate demand for wheat over a 14 year period i.e. 1964/65 to 1977/78. The demand for wheat has been taken in terms of per capita consumption or average available.
- (ii) To estimate the demand function (price, income & cross elasticities) through an analysis of time-series data by implementing econometric tools.

The model of this analysis has been constructed taking into account the following considerations:

- (a) Wheat is price inelastic.
- (b) Cross-elasticity of demand is positively inelastic.
- (c) Wheat is income elastic.

2.2 LIMITATIONS

More emphasis is laid on the econometric aspect of demand function of wheat. However, this study, has not been able to accomplish deep and sophisticated analysis of econometric tools. But it has tried to show elasticities by using simple regression and Cobb-Douglas production function type of model. The analysis of demand for wheat is not based on family budget data. It is based on market statistics. By market statistics we understand time series data on quantities available for consumption purpose. Considering the availability of data, our study of demand for wheat is limited within the country only. Moreover, the import of wheat seems to take place in years of famine only. In other years the import is insignificant. Thus this study has been focussed to the estimation of the demand function and the interpretation of the significance of the results obtained.

The model has been estimated using the secondary and time-series data under the roofing of simultaneous equations and it has been assumed that: Q_{dt} (percapita available consumption) = (total production - seed, feed, wastage etc. - Export + import) \div population.

The model presents several important variable like population, income, and prices in the demand functions. Though, taste and habit can also be used as dummy variables, this model is not able to include them.

In the demand model, rice has been used as substitute for wheat. Because, in far-western region, centuries, since, people have been consuming wheat after rice. In Terai and other regions the consumption of wheat is increasing day by day. Efforts are being made by the Government to change the food habit of the people in order to substitute wheat in place of rice as a staple diet.

III ESTIMATED DEMAND MODELS

(a) Linear: $Q_{dt} = a_0 + a_1 P_{wt} = a_2 P_{rt} + a_3 Y_t + u_t$

(b) Cobb-Douglas: $Q_{dt} = 90 P_{wt} P_{rt} Y_t e_1$

Where:

Q_{dt} = Average per capita consumption or availability of wheat (dependent variable) in year t.

P_{wt} = Average annual price of wheat Rs/kg.(indexed)

P_{rt} = Average annual price of rice Rs/kg. (indexed)

Y_t = Gross domestic product at constant price: Rs. in million (indexed) and

u_t & e_t are error terms

Applying the method of multiple-regression system under simultaneous equations model, this study has attempted to arrive at certain results for the estimation of demand for wheat. Using the mentioned technique the demand for wheat in Nepal is as follow:

(a) In linear form

$$QDT = - 23.138882 - 0.0121738 Pwt + 0.0923049 Prt + 0.267213 Yt.$$

(0.4737661) (2.4119136)* (1.3003035)

$$R^2 = .90 \quad R^{-2} = 87 \quad F_3 \quad 10 = 29.267103^{**}$$

$$Dw^* = 2.3170418.$$

a) Price - elasticity: $\frac{dQdt. Pwt}{dPwt. Qdt} = - 0.0879245$ (inelastic)

b) Cross elasticity; $\frac{dQdt. Prt.}{dPrt. Qdt} = 0.7609127$ (inelastic)

c) Income elasticity: $\frac{dQdt. Yt}{dYt. Qdt} = 1.48766$ (elastic)

$$*Dw = (e_t - e_{t-1})^2$$

—————; Durbin—watson is the most popular statistical tool for cheking serial correlation.
 e^2_t

But this result does not show any significant positive or negative serial correlation.

The figures in the parenthesis are their t—values. The stars refer to the significance of the relevant statistics.

For t—test :

One star indicates significance at 10 % probability level.

Two stars indicate significance at 5 % ,,

For F—test :

Two stars indicate significance at 1 % & 5 % probability level

R^2 above 50 indicates the significance of the model.

(b) In constant elasticity form

$$\text{LogQdt} = \text{Log} (-4.337714) - 0.0520777 \text{ LogPwt} + 0.6801538 \text{ LogPrt} + 1.92232 \text{ LogYt}$$

$$\quad \quad \quad (0.2530302) \quad \quad \quad (2.188316)^* \quad \quad \quad (1.607999)$$

$$R^2 = .90 \quad R^{-2} = .87 \quad F_{3,10} = 29.615865^{**}$$

The linear as well as the constant elasticity models have higher explanatory powers yielding the higher R^2 , R^{-2} and F values.

In the linear model the coefficient of Prt is significant and F-test is also significant. In constant elasticity model also these two coefficients seem significant. The interpretation of the results is basically based on the constant elasticity model.

IV A. Interpretation of Results

When all the variables are logged then the coefficients measure the elasticities. The first thing we notice is that the signs of the coefficients are theoretically correct.

The t-values on Prt is significant at 10% probability level and Yt is significant at 20% probability level, while t values of Pwt is not significant. And the F-value is also highly significant at 1% & 5% level. Looking at R^2 & R^{-2} they are also high i. e. The high R^2 indicates that regression equation explains 90% of the variation in the dependent variable (LogQdt). And the R^{-2} explains 87% of the total variance are explained.

The price of wheat (Pwt) has a negative sign and a very low coefficient and it indicates that wheat is almost an inelastic good. A 100% increase in its price leads to a reduction in the demand by 5.2077%.

Proceeding ahead to the coefficient of price of coarse rice which is positive and significant at 10% level indicates that a 100% increase in its price causes a 68.01% increase in demand for wheat, which shows that in comparison to the price of rice wheat is too cheap. So demand for wheat can only be increased by increasing the price of rice. If such would be the case then the consumers would shift their demand from rice to that of wheat.

Now, taking in consideration the coefficient of gross domestic product at constant price (Yt), we can interpret that wheat is income elastic. As income of the people increases the demand for wheat also increases. Though its coefficient is significant only at 20% level, a 100% increase in income causes a 192.23% increase in the demand for wheat. Since 40% of the Nepalese people are still below subsistence level any increase in their money income would cause

a rise in the demand for wheat. The establishment of bakery industries in various parts of the country in recent years would also increase the demand for wheat as an input. Further the industrialization can create a demand for labour which in turn could increase the demand for wheat.

B. Conclusion

This paper is simply an attempt to fulfill the long felt need for the study of demand for wheat in Nepal. The results are drawn by applying simple econometric tools, and hence the conclusions need careful consideration. Yet the results would be of some use for the concerned authorities.

From the demand model it can be forecasted that an increase in the price of wheat likely to raise production without affecting its demand because of the nature of its elasticities. In view of these facts, if the government intends to increase rice export, appropriate pricing policies should be adopted which would encourage farmers to produce more wheat.

Table 3

Data used for the analysis of the demand function of wheat in Nepal

F.Y.	Wheat Production (in M. Ton.)	Price index of wheat 1964/65 =100	Price index of rice 1964/65 =100	Average annual percapita consumption (in Kgs)	Index of GDP at constant price
1964/65	126	100	100	11.24	100
65/66	147	117	117	12.80	99
66/67	159	106	126	13.75	105
67/68	205	173	139	17.13	111
68/69	233	111	134	19.07	111
69/70	265	112	152	21.25	108
70/71	193	103	152	15.21	107
71/72	223	119	145	17.17	110
72/73	312	164	177	24.02	110
73/74	308	276	196	23.77	117
74/75	331	222	219	24.07	118
75/76	387	179	221	27.34	118
76/77	362	155	195	25.18	119
77/78	401	179	228	27.31	121

Source: Agriculture Statistics of Nepal 1977.

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Book Review

Prem R. Uprety. Nepal-Tibet Relations 1850-1930: Years of Hopes, Challenges, and Frustrations. Kathmandu: Puga. Nara, 1980. Pp. IX, 260. Rs. 125; \$ 15.00.

Within a year of the publication of his first study on Punjab politics Prem R. Uprety is back with a new and, obviously, more ambitious theme: crisis in Nepal-Tibet relations. Politics furnishes the situation and economy the thread connecting the elements of the story of the drama of eight eventful, and often violent, decades that unfolded in the Himalayas after the peace of Sugauli was broken by the reverberations of another war in 1855. The new volume gives a glimpse into the two neighbors' feuds and fears and their interplay with the Russian, Chinese, and British strategies against the fading glow of the Nepalese trade hegemony. Like the usual texts on history, it is state-oriented, but unlike their Indoverted theme, it tells a relatively unfamiliar story at a time when the word "Tibet" barely means more than a land of gold, myth, and mysticism to most people this side of the Himalayas. The newness of the theme also underlies part of the problems of the undertaking and it would be idle to concede that they have been fully resolved by the author, but the profuse footnotes and the broad sweep of his survey do point to his painstaking rummage of the sources.

The book is in seven parts with three major divisions—a prelude, the title theme, and a retrospective resume. It starts with the geo-social features of Nepal and goes on to the historic roots of relations. The war of 1855-56 that next follows sets the stage for the central parts—periods of relative tranquility (1856-1900) and turmoil (1900-1930). Then there is an analysis of the impact of the Phari route preceding a discussion of Nepal's status as a meso-Himalayan power before the study ends with a brief conclusion. The book bears no theoretical thrust except in its minor interpretative comments, but, in Bacon's terms, it is a book to be tasted: the often familiar elements of history from its pages leave a certain flavor of the day—the Ranas, aggressive and exhorting; the Lhasans, resenting and vengeful, the powers busy at their manouvers; the rattle of war alerts, the spurts of violence in Kuti, Kerong, and elsewhere; and the frenzy and the foibles of the high and low. The most impressive event, however, is the gradual but irrevocable retreat of Nepal's Himalayan paramountcy into the shadows of History.

Behind this retreat lay a whole era of a new nation's quasi-imperial adventures, its occasional triumphs, punctuated by tragedies, traumas, fears, and frustrations. To the initial euphoria of 1788 was added another victory (1856), but troubles soon started brewing (border dispute; the Loot of Lhasa, 1883) and the emergence of a new triangle of powers in the region and its concomitant developments (the Lee Warner Pan, the Curzon Scheme, Dorjjeff's visit, and the new conventions) brought new challenges. By the turn of the century the gaps in the relations between Nepal and Tibet had widened to such ghastly proportions that a showdown looked inevitable again. The property restraints and the salt trade crises followed later, but the Phari route which had already opened in the Chumbi Valley proved to be the last straw on the Nepalese hopes. The troubles of Nepal did not end there, however. For the new developments not only signalled a crisis of economy, but also posed a new challenge to the nation's status. The author takes up the issue and explores the Chinese brevets and the Nepalese missions as the roots of the status controversy in the last part of his book. People have often inferred the suzerainty of Nepal from these two facts of history. But the very base of the *post hoc, ergo propter hoc* is taken off the point by the author. The missions did not start after 1792—a point which many suppose and the author refutes—but after 1789, in victory. The author, however, does not spell out the reasons for such an origin which leaves the color of irony in his origin-in-victory argument uncleared. But the note has significance for his status postulate "... Nepal's semisatellite relations with China . . . was (sic) symbolic and superficial while that with India . . . was more real and significant. "(p.189). Of the evidences cited, three appear fundamental to the understanding of the status issue: Britain's declaration in 1923, the ambiguity of Sino-Nepalese agreements complemented by Chinese ambivalence in its policy, and Nepal's functional autonomy in its foreign affairs, facts that compel a closer scrutiny of the suzerainty hypothesis.

The author's interpretation of the missions and the acceptance of the honors as a ploy also carries a certain conviction with it. It appeased China, a distant and potential adversary of the north; and against Britain, Nepal's next-door, but far more formidable rival in the south, it gave a veneer of protective ambivalence. The point, however, is not without its own controversy. A few paragraphs later, there is a reference to Kathmandu's late discovery of the intent of the honors. The explanation? The author's silence on this point leaves the reader guessing. If it was sheer complacency of the Nepalese Court, it fails to explain Chandra's chagrin, and if it was the rulers' naivete or neglect, the confusion still lingers.

Both politically and economically, these eight decades formed the most crucial period

in the history of the two states' relations. Although these two categories of issues—the political and the economic—often meet in a kind of no man's land, making it quite difficult to separate one from the other, the economic thread does run throughout the phases and events of the period. Two issues, however, clearly emerge out of this welter of crises—currency conflict and trade. The latter, in fact, was the *casus belli* more than once. It, moreover, separated the basic interests and strategies of Nepal and British India from those of China and Russia. The two former states were involved, as it were, in a geopolitics of trade. For Nepal the lure lay in trade monopoly, but for Britain too, the prospects were no less tempting—Tibetan gold and a market in South China. Most of the British ventures in or across the Himalayas at this time (Kinloch, Logan, Bogle, Turner, and Younghusband) were directed toward these two ends. As for Nepal, obvious factors of distance and entrepreneurial skill had made Kathmandu the chief entrepot in the trans-Himalayan trade route over the Kumaon and Bhutan inlets. Although the debasement of coins precipitated the war of 1788, it was not the first occasion when Nepal went to war over a commercial issue. For from the days of Ram Shah and Pratap Malla through the civil war in Tibet (1862–63), down to the days of the Tea Affair, the opium traffic, and the salt trade crises trade did remain a source of conflict, crises, and often, war.

Except for three appendices, there are no data or details—longitudinal or cross-sectional—on the economic variables but the treatment of the economic parameter gives an interesting insight into the war economy, and although the study omits discourse on socio-economic relations (that would have surely added to its worth), the author's analysis clearly brings out the significance of trade as a determinant of binational interaction. As a work basically intended for study of state relations, the book should find favor with students of history, but the reader will not also miss its utility as a political analysis and economic history.

The layout of the book invites a couple of comments which should not be out of context at this point. To begin with, the year 1951 (the Fall of the Rana House) or 1959 (Lhasa's year of Thermidor) could have made more natural cutting points in place of 1930 with which the study ends. But if data were a critical issue, this point should be taken only as a wistful aside. The nature of the theme calls for treatment of the socio-cultural aspects of the relations; the author, of course, admits of its relevance but skips it altogether. The subtitle of the cover fails to correspond, in exactitude, to the comment delivered on page 206. Next, a minor problem of order can be discerned in, at least, two places. The second section of Part I looks misplaced and the crises described on pp. 141–48 seem to need a different arrangement. The abrupt ending of the Half-Breed issue leaves its solution open to the

reader's guess. As the semantics of the term "Nepal" has not been cleared, it may look a bit strange that the war of 1788 came to be called the "First" Nepal-Tibet War when Ram Shah and Pratap Malla had already their wars against Tibet. The same problem reappears with the issue of diplomatic relations between Nepal and China in the author's references at various places (pp. 18, 47, 49, 190) which are obvious contradictions. For some reason, the author has also ignored the importance of giving a background on Tibet; in a work that addresses the problems of two countries, it would deserve an adequate, if not equal, treatment. The author does not forget to mention topography as a point of similarity between the two neighbors; their similarity, however, does not end there. Moreover, the conclusion would have acquired a better touch of finality if the impact of the crises on the future relations were analysed. As it is, the reader has to wait for another volume for this part of the analysis.

At times, the reader has to wrestle with fuzzy phrases. Instances: the Tibetan equivalents given for "Kuti and "Kerong" (they differ with the pages); expressions such as *characterized by the lack of penetration* (penetration of what? p. 203); *the country of Deba Raj* (the object of reference is not clear to the general reader, p. 25); *the first trasnit hamba to the Dalai Lama* (p. 120); and a statement suggesting that a war could both be confined to two countries and involve two others at the same time (p. 40). Lastly, on page 206 Britain's role as one of the influential forces in the region is obviously missing.

The expository narration, interspersed with quotes and comments and comfortably rendered translation, gives the reading an easy flow. The rich bibliography introduces new material as it also brings out the paucity of literature on the theme. The Tibetan and Chinese sources are virtually absent but the new sources from the recently opened Archives of the Foreign Ministry of Nepal on which the author draws heavily may not be available elsewhere, and hence, should be a valuable source and stimulus for further study. The author's own previous work, though, has been wrongly placed; it belongs in the English list. The indexing, otherwise adequate, omits some expected entries and the price of the volume may restrict its purchase to libraries and collections overseas. Maps, charts, chronology, and glossaries have been left out altogether. While not essential, they would have increased the book's overall appeal and value.

The presentation, as it stands in this first edition, may somewhat disappoint the sophisticated reader. This brief scan includes only flaws which raise their heads too obviously and too often to escape notice. A particular case is of punctuation which is often missing or misplaced.

Errors of inconsistencies in the use of articles, italics, capitals, disjunctions, pronominal use for countries, and superscription occur only occasionally but verbs can quite frequently be seen refusing to agree with their subjects. Also, some words have been used with others in whose company they would generally be loath to be seen. Specimens of such oddities: "*Nepal thought that it was her duty to inform ... China.....of the potitical development within the country*" (p. 47); "*the Thutam border dispute irritated Nepal - Tibet relations*" (p. 149) (personification of abstract terms); "*new foreign policy innovations*" (redundance) (p. 47). Further, there is a frequent switch between the American and British usages and also between the two calendars used. The changing spelling of "Desideri" (it is not the only case) may make the Father roll in his grave! The single sections of parts III, IV, and VI hardly need enumeration and finally, the author's fond use of words such as "as well as" and "too" gets them overworked. Apart from any significance or insignificance that the reader may care to put upon diction and nuances, it is obvious that a little more of meticulousness and less of haste would have added much to the book's merit. The slapdash presentation, so usual with the national press and publication, often brings to mind McCartney's epigram:

"If he, who runs, may read (write?), he who reads may run."

Fortunately, the volume is too useful to make the reader run, for the ultimate test of a book lies in its meaningful use. The hazards of evaluating a contemporary production notwithstanding, it would be a fairly safe surmise to say that the new arrival constitutes a benchmark in our understanding of the history of the crisis-behavior of state-relations between Nepal and Tibet. If its approach and theme give a respite from the traditional clout of historians, the candor of the author's analysis spares the reader much of the bias and monotony that often mar Nepalese books on history. Books from the national market quite often leave the reader with a question over their rationale. This one certainly does not.

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