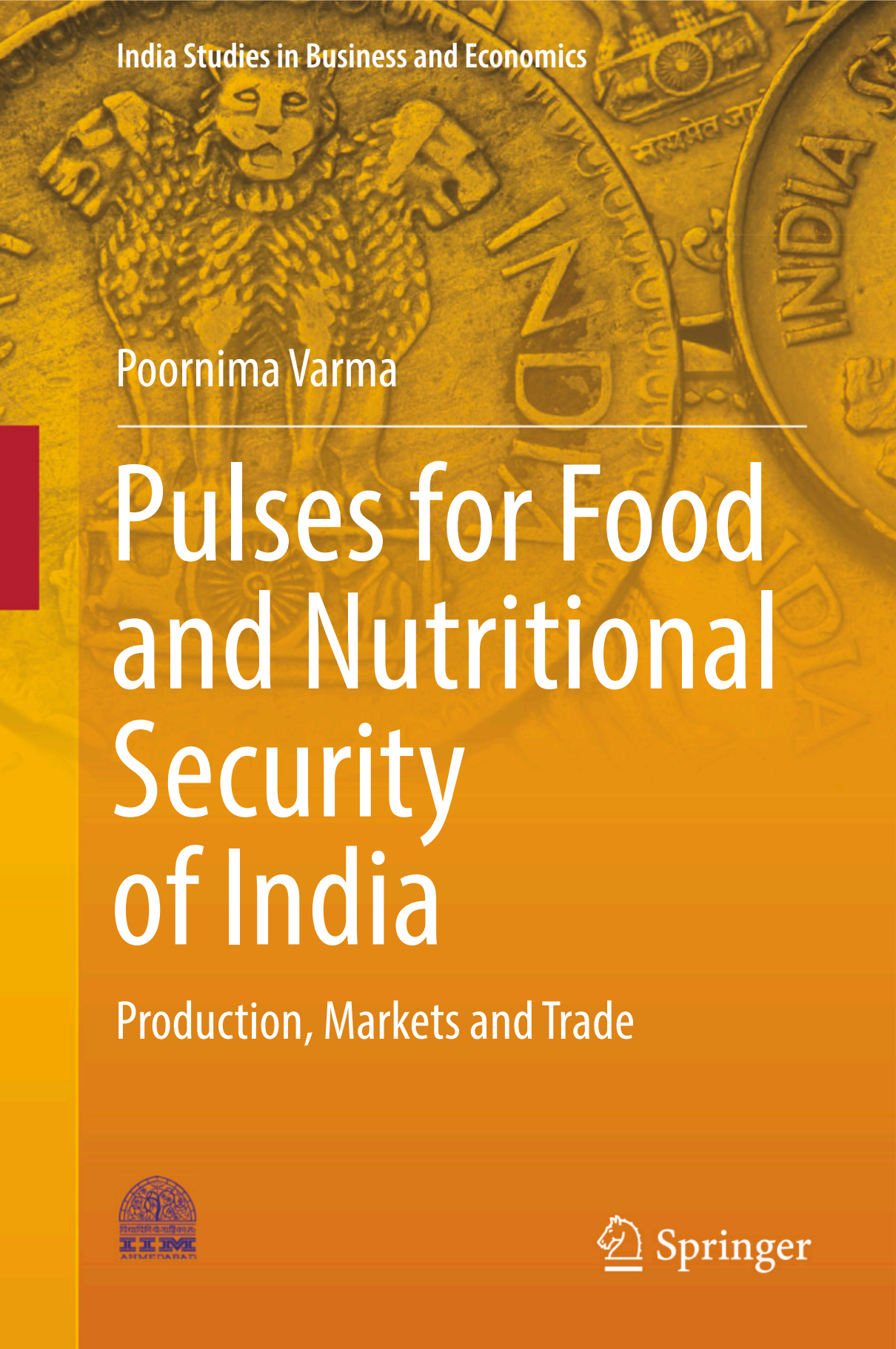
India Studies in Business and Economics
Poornima Varma
Pulses for Food and Nutritional Security of India
Production, Markets and Trade
IIM AHMEDABAD
Springer

India Studies in Business and Economics

CMA Publication No. 253

The Indian economy is one of the fastest growing economies of the world with India being an important G-20 member. Ever since the Indian economy made its presence felt on the global platform, the research community is now even more interested in studying and analyzing what India has to offer. This series aims to bring forth the latest studies and research about India from the areas of economics, business, and management science, with strong social science linkages. The titles featured in this series present rigorous empirical research, often accompanied by policy recommendations, evoke and evaluate various aspects of the economy and the business and management landscape in India, with a special focus on India's relationship with the world in terms of business and trade. The series also tracks research on India's position on social issues, on health, on politics, on agriculture, on rights, and many such topics which directly or indirectly affect sustainable growth of the country.

Review Process

The proposal for each volume undergoes at least two double blind peer review where a detailed concept note along with extended chapter abstracts and a sample chapter is peer reviewed by experienced academics. The reviews can be more detailed if recommended by reviewers.

Ethical Compliance

The series follows the Ethics Statement found in the Springer standard guidelines here. https://www.springer.com/us/authors-editors/journal-author/journal-author-helpdesk/before-you-start/before-you-start/1330#c14214

Poornima Varma

Pulses for Food and Nutritional Security of India

Production, Markets and Trade

Springer

Poornima Varma
Centre for Management in Agriculture
Indian Institute of Management Ahmedabad
Ahmedabad, Gujarat, India

ISSN 2198-0012 ISSN 2198-0020 (electronic)
India Studies in Business and Economics
ISBN 978-981-19-3184-0 ISBN 978-981-19-3185-7 (eBook)
https://doi.org/10.1007/978-981-19-3185-7

This Springer imprint is published by the registered company Springer Nature Singapore Pte Ltd.
The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Foreword

The Centre for Management in Agriculture (CMA), Indian Institute of Management, Ahmedabad, is actively engaged in applied and problem-solving research on agriculture, food and agribusiness management, towards achieving the major goals of agricultural and rural development in the developing world. As a result, over the years, CMA has developed considerable expertise in a large spectrum of areas of agriculture and agribusiness, including the management of agricultural inputs, agro-processing, agri-food marketing, rural infrastructure, grass-roots innovations, appropriate technologies for arid and semiarid regions, international agricultural trade and WTO issues, global competitiveness, commodity markets, food safety and quality including organic food, food supermarkets, food value chains and farmer collectives like producer companies. CMA undertakes research of this kind, especially for the Ministry of Agriculture, Government of India, and on its own as well as at the request of various other international and national organisations.

Pulses are rich in protein content and a major source of protein in Indian diet of all categories of people. The protein content in pulses is double the protein content of wheat and three times more than that of rice. Cereals have predominantly contributed to protein intake in India despite pulse protein having higher amounts of requisite amino acids such as lysine that are associated with enhanced protein quality. Pulses are the cheapest source of non-cereal plant protein, yet pulses consumption has been declining over the last two decades, and the growth in pulse production has straggled behind cereal production. Moreover, the production of pulses was not commensurate with the demand as net availability lagged behind population growth. The excess demand is primarily due to the stagnation in productivity which is further accelerated by the stagnant area under cultivation. As a result, the per capita net availability of pulses in the country declined sharply over the years until recently. Of late, the Government of India's interventions to improve the area and production of pulses seemed to have produced some positive impact as we can see an improvement in area and production of pulses. However, the persistent deficit and the soaring domestic prices of pulses made it inevitable for the country to import pulses. Despite being the second largest producer of pulses, the dependency on imported pulses continues to grow in the country. The imports have slowly come down when the

country has been able to improve the domestic production. But, this production and price uncertainty coupled with poor crop productivity has always been a concern especially when pulses play an important role in contributing to food and nutritional security of India.

The present research examines the factors affecting the production of pulses (chickpea and pigeon pea), the impact of government policies such as MSP and NFSM on pulses production, the factors influencing the farmers access and utilisation of MSP and the pricing behaviour of pulses importers, exchange rate pass-through and its implications. The study makes use of both the secondary as well as primary data. The primary data is collected through a comprehensive household survey of 572 pulse-producing households in three major pulse-producing states—Karnataka, Maharashtra and Madhya Pradesh. Subsequently, the district that has high production of pulses was identified, and they were Gulbarga from Karnataka, Wardha from Maharashtra and Narsinghpur from Madhya Pradesh. The results offer unique policy-relevant insights on the factors influencing the production of pulses, the implications of import dependency to meet excess demand and the impact of government policy interventions.

I am sure that the study will be found useful by policymakers, researchers as well as others interested in agricultural policy, supply response analysis and the welfare of farmers.

Errol D'Souza
Director, Indian Institute
of Management Ahmedabad
Ahmedabad, India

Acknowledgements

This study would not have been possible without the generous help and support of several individuals and institutions. I would like to express my sincere gratitude to the Ministry of Agriculture, Government of India, for financial support in undertaking this study. My special thanks to my colleagues Prof. Vasant. P. Gandhi and Prof. Sukhpal Singh for their valuable suggestions and comments at various stages of this study. I would like to also thank Prof. Vijay Paul Sharma, Chairman, CACP, for some of his valuable suggestions and comments during the initial stages of this study.

I would like to express my sincere gratitude to Prof. M. Gopinath, Distinguished Professor of Agricultural Marketing from University of Georgia, for painstakingly going through this study and giving his valuable comments and suggestions on this study. His comments have helped me in enriching this study. Prof. Vikas Rawal, Professor, JNU also provided several key inputs for this study, and I sincerely acknowledge his support. I also thank Dr. Reji K Joseph, Associate Professor, ISID, for his useful comments.

My thanks to Prof. Ranjan Ghosh for his timely and valuable inputs and suggestions without which this study would not have been possible. I also thank Dr. C. S. C. Sekhar, Director IEG, for his valuable comments and suggestions that helped in enriching this study.

My study benefited a lot from the support of PRADAN to conduct the field visit of Madhya Pradesh. I record my deepest gratitude to PRADAN, for their support in collecting the data from Narsinghpur district of Madhya Pradesh. My sincere gratitude also goes to Maruti Manapede, State Vice President, Karnataka, Pranth Raith Sangh, Gouramma and all the members of All India Kisan Sabha (AIKS) who helped me in organising the meetings and discussions with farmers in Gulbarga, Karnataka.

My sincere gratitude also goes to the officers of the Department of Agriculture, Gulbarga and Nagpur districts. I would like to extend my sincere gratitude to Kamalnayan Jamnalal Bajaj Foundation of Wardha especially Raju Petkar in coordinating farmers meeting in Wardha and also in collection of the data. I would like to also thank his team members for their valuable contributions. I would like to extend my gratitude to Viral of IIMA library for being very proactive in sending the materials

and arranging the data. Thanks are also due to CMA staff—Uma, Mini, Dipali, Viji and also Ashwin for their enthusiastic help in each and every stages of this study. I would like to also thank Ashutosh for helping me with some of the data collection and compilation. Akash also helped me in obtaining the monthly import data from DGCI&S and through IIMA library.

I would like to extend my special acknowledgement to Nikita Pandey for her invaluable contribution to this study. This study would not have materialised without her enthusiastic efforts in collecting the data from the library and field and assistance in writing and data analysis. My special thanks also go to Raja Mohanty for his invaluable help and support in analysing the data. Sonali Kaur Bhatia deserves special acknowledgement for her invaluable contribution in the initial stages of study by contributing to the writing of research proposal, analysis of data as well as field visit to Wardha and Gulbarga for collecting the data. I would like to also thank Nicky Johnson for all his timely support. I owe a lot to Anar and Jannet for their valuable contributions to supply response analysis. Nikhil Singh helped me immensely with editing and formatting of the thesis.

Needless to mention while I owe a lot to the numerous individuals who contributed significantly to conduct this study, the data analysis and the views expressed in this report and any omissions or errors that remain in the report are entirely mine.

Poornima Varma

Executive Summary

Pulses play a pivotal role in a country like India for all categories of people due to its rich protein content. The protein content in pulses is double the protein content of wheat and three times more than that of rice. Pulses are mostly cultivated under rain-fed conditions and do not require intensive irrigation facility, and this is the reason why pulses are grown in areas left after satisfying the demand for cereals/cash crops. Apart from its rich protein content, pluses possess several other qualities such as they improve soil fertility and physical structure, fit in mixed/intercropping system, crop rotations and dry farming and provide green pods for vegetable and nutritious fodder for cattle as well.

Although being the largest pulse crop cultivating country in the world, pulses share to total food grain production is only 6–7% in the country. As a result, the production of pulses was not commensurate with the demand. The excess demand is primarily due to the stagnation in productivity which is further accelerated by the decline in area under cultivation. As a result, the per capita net availability of pulses in the country declined sharply over the years. The persistent deficit and the soaring pulses domestic prices made it inevitable for the country to import pulses. Despite of being the second largest producer of pulses, the dependency on imported pulses continues to grow in the country.

Against this backdrop, the present research examines the factors affecting the production of pulses (chickpea and pigeon pea), the impact of government policies such as MSP and NFSM on pulses production, the factors influencing the farmers access and utilisation of MSP and the pricing behaviour of pulses importers, exchange rate pass-through and its implications.

This study has been divided into 11 chapters including introduction and conclusion. Chapter 1 as an introduction provided the background, objectives, data and methodology along with chapter scheme. Chapter 2 gave an overview of pulses economy. Chapter 3 discussed the importance of pulses for nutritional and food security, the importance of sustainable production practices to improve the pulses productivity and food security with an emphasis on India. Chapter 4 discussed the salient features of Government of India's National Food Security Mission (NFSM) and its objectives especially in the context of pulses production. Chapter 5 provided

a detailed discussion of socio-economic profile of the sample households. Chapter 6 provided an overview of pulses production, trade and government policies with a special focus on the trends in trade and its implications. Chapter 7 analysed the import pricing behaviour and exchange rate pass-through into prices of imported pulses. Chapter 8 provided an overview of an evolution of minimum support price policies and MSP for major pulses. Chapter 9 analysed the factors influencing the access to information regarding MSP and utilisation of MSP in a joint framework. Chapter 10 made an analysis of factors influencing the supply response of chickpea and pigeon pea with a special emphasis on MSP and NFSM. Chapter 11 provided the conclusion and policy implications of the study.

The detailed household-level survey was conducted for three major pulse-producing states. They are Karnataka, Maharashtra and Madhya Pradesh. From each state, one of the major pulse-producing districts was selected for further analysis. From Karnataka, Gulbarga was selected, from Maharashtra, Wardha was selected, and from Madhya Pradesh, Narsinghpur was selected.

Primary data was collected through a comprehensive household survey in the above-mentioned three districts of three major pulse-producing Indian states during 2017–2018. The farmers were selected through a random sampling technique. The sample consisted of 482 pigeon pea farmers and 316 chickpea, out of which 227 farmers were cultivating both chickpea and pigeon pea. The survey was conducted through questionnaire, framed in such way as to draw out details covering household characteristics, wealth and farm characteristics, institutional and access-related variables, risk and economic factors.

After discussing the background, objectives, data and methodology in the first chapter, the second chapter provided an overview of pulses economy with a special emphasis on the trends in area, production and yield in comparison with world. The analysis broadly showed that there had been a substantial decline in area and production of pulses in India. Indian yield was much below the world average, and the yield gap between the two got widened since 2001. It was the same year, the decline in production of pulses was more prominent. However, in the year 1991, the yield gap got narrowed and came very close to the world average. Interestingly, this was the same year when India marked a record production in pulses.

The fifth chapter provided an overview of the socio-economic profile of the sample households. The total households interviewed were 572 drawn from three major pulse-producing states—Karnataka, Maharashtra and Madhya Pradesh. Majority of the households in the sample were either semi-, medium or medium farmers, and agriculture was the main livelihood option for majority of the sample households. Narsinghpur (Madhya Pradesh) had the highest share of large farmers in the sample, whereas Wardha (Maharashtra) had the highest share of marginal and small farmers. In our sample, 482 farmers were cultivating pigeon pea and 316 farmers were cultivating chickpea, out of which 227 farmers were cultivating both the pigeon pea and chickpea. Majority of the sample households did not have any awareness of government schemes to promote pulses production or new production techniques to reduce crop loss and improve productivity. The farm size-wise analysis showed that large farmers were more aware about new production practices as compared to other

farm categories. However, the access to training offered by government and extension services were the highest among the sample households from Wardha (Maharashtra). Interestingly, despite having higher access to training, extension services and knowledge about government schemes and new production techniques, the information of MSP received by households in Wardha (Maharashtra) was lower than that of Narsinghpur (Madhya Pradesh). This is due to the fact that Narsinghpur (Madhya Pradesh) had the highest share of large farmers in the sample. The size-wise percentage of farmers who received training showed that large farmers had received more training. The training was relatively higher for semi-, medium, medium and large farmers as compared to marginal and small. In addition to the fact that Narsinghpur (Madhya Pradesh) had relatively large farmers with greater access to training, the households from Narsinghpur (Madhya Pradesh) had greater access to information regarding MSP. The access to MSP information was increasing as size of the farm increases. Interestingly, though households in Narsinghpur (Madhya Pradesh) had the highest information about MSP, households availing MSP was much lower and lower than Wardha (Maharashtra). In Maharashtra, almost all farmers who had information about MSP availed MSP. The percentage share of households with information was 52% and utilisation was 50%. The percentage share of households in each farm size category who were availing MSP was the highest among semi-, medium, medium and large households. The percentage share of households who were not availing MSP was the lowest among marginal and small farmers.

The analysis in Chap. 6 showed that there has been a substantial increase in the imports of most of the pulses in the last several years. Also, the share of India's imports in world imports of pulses also showed a sharp increase. This points out the increasing import dependency and severe supply deficit that India is facing in terms of meeting the demand for protein-rich crop. The widening gap between supply and demand and the domestic uncertainties with respect to the production, etc. might continue to increase the import dependency unless effective policy measures are undertaken to improve the production and productivity and pulses. The implications of long-term dependency on import depend upon the nature of import pricing that is undertaken by the importers as we have already discussed that the import of each type of pulses is dominated by one or two single largest importers. This may increase the potential for monopoly pricing.

Chapter 7 did an analysis of pricing behaviour of pulses importers in Indian market and the exchange rate pass-through into imported pulses prices. When the currency of importing country depreciates, the import is expected to become costlier. However, if the exporter is absorbing part of the increase in price to retain the market share in the importing country, then the exchange rate pass-through into import prices will be partial or incomplete. The elasticities of import prices with regard to changes in the exchange rate can range from 0% to 100%, depending on the pricing strategy of exporters. Additionally, it also shows whether an exporter is following a producer pricing strategy or local currency pricing. The former takes place in a perfectly competitive setting where the low of one price is expected to prevail due, and as a result, any change in exchange rate will get fully transmitted to import prices. The latter takes place under imperfect competition. Employing the econometric technique

of Panel Corrected Standard Errors (PCSE) estimation technique in pricing to market (PTM) framework, the results from our analysis showed that the most of the importers were practising non-competitive pricing behaviour due to both the market-specific characteristics as well as exchange rate-induced effects.

The significance of the exchange rate parameter β_i and the country-specific effects parameter λ_i in most of the models indicates that the importers work with a fluctuating exchange rate and a varying mark up over marginal cost. The analysis of the asymmetric effects of exchange rates through an interaction dummy showed that for majority of the products, the appreciation of the Indian rupee against the partner country had greater impact than the depreciation.

We tested the PTM model under three different exchange rates, i.e. the nominal, the real and the commodity-specific (import) trade-weighted exchange rates. For all the products under study, we observed PTM in at least one of the destination markets either through exchange rate changes and/or through country-specific effects. The analysis also showed that the commodity-specific exchange rate better predicts the PTM behaviour in the case of kidney beans and peas, whereas the nominal exchange rate better predicts the PTM behaviour of chickpea and pigeon pea.

The analaysis of the exchange rate effect showed that local currency price stabilisation by the Indian importers was more prominent than the amplification of exchange rates. This is indicating competition among other importers.

Chapter 8 is devoted to examine the role of country-specific market share on exchange rate pass-through and pricing behaviour of major pulses imported to India. The analysis in this chapter shows that the exchange rate pass-through is increasing in market share, and after reaching a maximum, it declines. The results provide new empirical insights into an inverted U-shaped relationship between exchange rate pass-through and market share. There have not been many analyses to see the influence of market shares on exchange rate pass-through in the food and agricultural sector. This chapter is making an attempt to analyse the impact of market share on exchange rate pass-through trade by analysing the asymmetric nature of exchange rate pass-through in market share. Our analysis in this chapter also showed that the exchange rate pass-through in market share is asymmetric. The analysis of long run exchange rate pass-through is also undertaken in this chapter, and the results provide empirical support for incomplete of partial exchange rate pass-through in the long run as well. The long run elasticity came out to be significant.

There are now ample pieces of evidences in the literature that the exchange rate pass-through varies under different market shares. The ERPT varies due to the changes in perceived elasticity of demand under various market shares. Our study provides new empirical evidence for an inverted U shape for ERPT in market share. Our results for interaction between ERPT and market share show that ERPT is increasing in market share. However, the interaction between ERPT and quadratic term of market share shows that a further increase in market share is leading to a low ERPT, and hence, ERPT is decreasing. The existing studies generally provide evidence for a U-shaped ERPT in market share especially for exports (Garetto, 2016; Auer and Schoenle, 2016). However, Devereux, Tomlin and Dong (2017) findings show a U-shaped relationship between pass-through and exporter market share but

a negative relationship between importer market share and pass-through. However, our results provide unique empirical evidence that has an overlap with the findings in the existing studies.

As far as the impact of exchange rate changes on prices is concerned, the results show that the exchange rate pass-through was incomplete or partial both in the short run as well as in the long run. As a result, the importers exercise a non-competitive pricing behaviour in general. The negative coefficient implies that the import prices tend to be adjusted downwards when there is a depreciation of Indian currency in relation to the importer's currency. This shows that the residual demand is elastic, which is an indicator of competitive behaviour. As expected, greater trade openness and domestic demand had a positive and statistically significant impact on the import price. The variable to capture the cost of the importing country—PPI—came out to be positive and statistically significant in all models for peas and in one model for kidney beans.

The pass-through was also asymmetric in nature, indicating pass-through was not the same under both appreciation and depreciation scenarios. One point that is worth mentioning here is the depreciation that the Indian currency was generally facing against its trading partners. When the import became costly, the importers might have absorbed the part of the price rise and, therefore, less ERPT. The ability of the importer to absorb the price rise would have been higher under very high market share, and perhaps, this could be the reason for an inverted U shape of ERPT in market share.

Chapter 9 discussed the evolution of agricultural and food security policies in India along with the effectiveness of MSP and procurement. The data and studies at the national level broadly indicated that MSP is an important policy instrument in encouraging farmers and to stabilise market prices. However, the percentage of farmers who were aware of MSP was less especially for pulses. This was also reflected in the lack of knowledge about procurement agencies. Interestingly, the percentage of households who sold their products to procurement agencies was even lower than the percentage of households who had information about procurement agencies. In Chap. 5, our analysis of sample households from three states selected for analysis also showed poor awareness of MSP. The farmers who avail MSP even with a positive information about MSP was also lower.

Therefore, in Chap. 10, we analysed the factors influencing the access to information regarding MSP and the decision to avail MSP. The regression equation was estimated using the conditional mixed-process (CMP) command which uses the mixed-process estimator. The results showed that Maharashtra farmers were more enthusiastic in availing MSP despite of the fact that the information regarding MSP was highest among the farmers from Madhya Pradesh. However, farmers who had more diversified crop cultivation were not very enthusiastic in availing MSP. The majority of the farmers in Madhya Pradesh in our sample were large farmers, and most probably, they are more diversified. Market access came out to be as an important factor in information and in availing MSP. The risk faced by farmers also increased the chances to avail MSP, and this points out how important MSP is in mitigating the negative effects of risk.

In Chap. 11, the supply response of two major pulses—chickpea and pigeon pea—cultivated in India is analysed based on Nerlove's expectation framework and using a dynamic panel data estimation technique. The analysis is based on secondary data collected at the district level from major pulse-producing states of India. The results broadly showed that chickpea and pigeon pea farmers are more sensitive to price factors than non-price factors. However, they were even more sensitive to government's minimum support prices than own market prices. The Government of India's NFSM to boost pulses production through technological interventions and supply of improved varieties of seed showed to have produced positive results in most cases. The acreage response of both the crops as well as the yield of pigeon pea benefited positively by the introduction of NFSM. The high cost of cultivation, as expected, had a negative impact on the acreage allocation, and yield of chickpea indicating the higher cost is problematic mainly for chickpea producers. Whereas in the case of pigeon pea, the cost was negative but insignificant in impacting the area and positive in impacting the yield. The positive results indicate that the cost incurred by pigeon farmers to buy better-quality seeds and other inputs were instrumental in improving the yield.

The results showed that pigeon pea farmers are more integrated to the market and are generally in a better position to take advantage of the government policies and market prices. This was reflected in relatively higher response of acreage allocation to market prices and minimum support prices as well as the less sensitivity of cost of cultivation and non-price factors in affecting the area and yield. The pigeon pea farmers were also in a better position to adjust and revise their acreage allocation in response to the prices and yield prevailed in the previous year.

Contents

1 Introduction 1
1.1 Introduction 1
1.2 Key Issues: Production Uncertainty and High Import Dependency 2
1.3 The Detailed Objectives of the Study Can Be Listed as Follows 4
1.4 Study Area 5
1.5 Data Collection 5
1.6 Methodology 6
1.7 Chapter Scheme 6
References 7

2 An Overview of Pulses Economy 9
2.1 Introduction 9
2.2 Crop-Wise Analysis 11
2.3 Production of Pulses in Major States 13
2.4 Shift in the Area Under Pulses Cultivation 19
2.5 Conclusion 22
References 25

3 Pulses Production and Food Security 27
3.1 Introduction 27
3.2 Consumption of Pulses 33
3.3 Import of Pulses 34
3.4 Production Technologies 36
3.5 The Need for Sustainable Practices 41
3.6 Major Varieties 41
3.6.1 Rabi Pulses 41
3.6.2 Kharif Pulses 42
References 43

4 National Food Security Mission and Pulses Production 45
4.1 Introduction 45
4.2 NFSM-Pulses Districts 46
4.3 Major Interventions 46
4.4 NFSM in Maharashtra 47
4.5 NFSM in Karnataka 51
4.6 NFSM in Madhya Pradesh 51
Reference 53

5 Socio-Economic Profile of the Sample Households 55
5.1 Introduction 55
5.2 Conclusion 64

6 Pulses Production, Trade and Government Policies 67
6.1 Introduction 67
6.2 Country-Wise Imports of Major Pulses 70
6.3 Tariff Scenario 77
6.4 Conclusion 77
References 78

7 Pricing and Exchange Rate Pass-Through in Pulses Imports 79
7.1 Introduction 79
7.2 The Concept of Pricing to Market Behaviour and Exchange Rate Pass-Through 80
7.2.1 Producer Currency Pricing Versus Local Currency Pricing 81
7.3 Literature Review 82
7.3.1 Market Share Model Versus Bottlenecks Model 82
7.4 Model Specification 83
7.5 Data Description 84
7.6 Results and Discussion 85
7.6.1 Commodity-Specific Exchange Rate Model for Kidney Beans 86
7.6.2 Commodity-Specific Exchange Rate Model for Peas 87
7.6.3 Nominal Exchange Rate Model for Chickpea 87
7.6.4 Nominal Exchange Rate Model for Pigeon Pea 88
7.7 Conclusion 89
Appendix 90
References 96

8 Asymmetric Exchange Rate Pass-Through, Market Share and Import Pricing 97
8.1 Introduction 97
8.2 Empirical Studies on ERPT and Market Share 98
8.2.1 Pass-Through and Market Share 100
8.3 Model Specification 101
8.4 Pulses Imports, Data and Exchange Rate Variable 105

8.5 Results and Discussion 107
8.6 Conclusion 108
References 112

9 Minimum Support and Price Policies 115
9.1 An Overview of Government Interventions in Agriculture 115
9.2 Minimum Support Prices Scheme 118
9.3 The Policy Bias and Crowding Out of Pulses 119
9.4 The Relationship Between MSP and Wholesale Prices 122
9.5 Procurement Policy and Operations 125
9.6 Conclusion 129
Appendix 129
References 132

10 Information and Utilisation of MSP: Major Determinants 135
10.1 Introduction 135
10.2 Conceptual Framework 136
10.3 Model Specification 136
10.4 Description of Dependent and Explanatory Variables 137
10.5 Results and Discussion 138
10.6 Conclusion 143
References 144

11 Supply Response of Major Pulses 145
11.1 Introduction 145
11.2 Key Government Interventions- MSP and NFSM 147
11.3 Theoretical and Empirical Literature 149
11.4 Model Specification 152
11.5 Data and Variable Construction 154
11.6 Results and Discussion 158
11.7 Conclusion and Policy Implications 164
Appendix 165
References 166

12 Conclusion and Policy Implications 169
References 175

List of Figures

Fig. 2.1 Area under pulses in India in million ha. *Source* CMIE 10
Fig. 2.2 Trends in production of pulses in India in million tonnes. *Source* CMIE 10
Fig. 2.3 Trends in pulses in yield kg per ha. *Source* CMIE 10
Fig. 2.4 Yield of pulses in hg/ha. *Source* FAOSTAT 11
Fig. 2.5 Percentage share of area under arhar (pigeon pea) and gram (chickpea) in total pulses area. *Source* CMIE states of India 12
Fig. 2.6 Area under gram (chickpea) and arhar (pigeon pea) in India in million ha. *Source* CMIE states of India 12
Fig. 2.7 Percentage share of arhar (pigeon pea) and gram (chickpea) production in total pulses production. *Source* CMIE states of India 13
Fig. 2.8 Production of gram (chickpea) and arhar (pigeon pea) in India in million tonnes. *Source* CMIE states of India 13
Fig. 2.9 Pulses production in Indian states. *Source* Ministry of Agriculture and Farmers' Welfare, Government of India 14
Fig. 2.10 Total area under pulses production in India, state-wise, in thousand hectares. *Source* CMIE States of India 16
Fig. 2.11 Area under chickpea in India in major pulse-producing states, in thousand hectares. *Source* CMIE States of India 17
Fig. 2.12 Area under pigeon pea in India in major pulse-producing states, in thousand hectares. *Source* CMIE States of India 17
Fig. 2.13 Area under kidney beans in major pulse-producing states of India, in thousand hectares. *Source* CMIE States of India 18
Fig. 2.14 Area under peas in major pulse-producing states of India, in thousand hectares. *Source* CMIE States of India 19
Fig. 2.15 Production of pulses in major pulse-producing states, in thousand tonnes. *Source* CMIE States of India 20
Fig. 2.16 Production of pigeon pea in major pulse-producing states. *Source* CMIE States of India 21