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FOSRIN

Food Security through Ricebean Research in India and Nepal

Report 10: Introducing ricebean to the supply chain
Deliverable 1.3: Report on a strategy to introduce ricebean into the supply chain

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Executive summary

The rural population in India and Nepal depend on a range of little known crops for their food security. There have been few efforts of scientists to improve the yield of these “orphan crops” by breeding. The potential role of orphan crops, using the example of ricebean, in improving the food security of rural poor in both countries was one focus of this project. The determination of relevant ricebean characteristics (Buergelt et al., 2010) was the first step to improve ricebean and increase the probability of market acceptance in India and Nepal, but improved varieties still need to be introduced into Indian and Nepalese markets. To facilitate a successful market introduction, a marketing strategy is required based on a detailed investigation of the agricultural marketing systems in India and Nepal. These systems are complex, fragmented, and hardly straightforward. Therefore four theoretical perspectives were used to assess the relevant aspects of the marketing of pulses, and especially of ricebean. This study employed the perspectives of: (i) marketplaces, (ii) market channels, (iii) supply chains and networks, and (iv) generalized markets. Additionally, a model of subsistence households was involved because most ricebean growing farmers live at subsistence or semi-subistence levels. The key concepts of the different perspectives were consolidated into a ‘toolbox’ that was used to analyse and describe the marketing system for pulses in India and Nepal. Sources of information and data about the agricultural marketing systems were scientific literature, databases and governmental publications and websites, and interviews with ricebean farmers and traders were carried out.

In India, the production of pulses is stagnating or declining while the population is growing. In 2007, 15 M t of pulses were produced in India and about 3 M t imported, with chickpea, pigeon pea and lentil the most important pulses grown. The price elasticity of demand for pulses is similar to that of milk, sugar and edible oil. Very poor rural consumers decrease their pulse consumption by 0.8% if prices rise about 1%. Nepalese farmers produce about 270,000 t of pulses per year for about 28.6 million people. Until 2003, Nepal was a net-exporter of pulses, since 2004 the quantity imported has exceeded that exported. The most important pulses are lentil, chickpea and pigeon pea. Nepalese consumers spend about 3% of their food expenditure on pulses, somewhat lower than in India. The market channel for pulses in general involves six stages: farmers, commission agents and brokers, wholesalers, mills, retailer, and consumers.

Most ricebean growing farmers in India and Nepal produce only small quantities, with an average of 40kg per farmer. About 40% sell ricebean, with an average marketed surplus of about 30% of the production. Four stages with intermediaries were identified in the ricebean channel: farmers, collectors, wholesalers, supermarkets, kiranas (local stores), and consumers. Farmers sell to collectors, wholesalers and kiranas. Most farmers sell to kiranas because they pay the highest prices. The average margin for ricebean is 19% of the buying price in India and 15% in Nepal.

The application of the toolbox to investigate the agricultural marketing system in India revealed that agents along the ricebean pathway from farmer to consumers make no efforts to coordinate their decisions and actions. The relationship between agents is only transaction-based, and all information is based on price. The exchange of ricebean is decentralized in many regions because most farmers sell small quantities to kiranas. This increases farmers’ transport costs and decreases their margins. Schneider’s model of subsistence households explains that farmers’ marketed surplus depends on the price they receive for a commodity. If transport costs reduce farmers’ margins, they will reduce their marketed surplus and increase their home consumption.
Moreover, ricebean is heterogeneous in phenotypic characteristics such as form, colour and size. Grading would decrease the transaction costs of both buyers and sellers, because measurement costs for inspection would decline. Grades transfer accurate information that decreases consumers’ efforts for measurement and inspection (Barzel, 2002). Transaction costs are also reduced by the usage of standard weights and labelling.

In summary, the investigation of the agricultural marketing system revealed particularities that need to be considered before a successful market introduction of an improved ricebean variety.
The ricebean network: introducing ricebean to the supply chain

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1 Introduction

Ricebean (Vigna umbellata) is an underutilised grain legume grown in marginal hill areas in India and Nepal. It is found in many parts of Nepal and in the Indian states of Uttarakhand, Himachal Pradesh, Assam, Orissa, Madhya Pradesh and Chhattisgarh, often intercropped with maize. Areas where ricebean is grown today are often remote in respect of access to markets, and contain many subsistence households. Ricebean grows well on many soils, and has good pest resistance as well as the potential for good yields of nutritious fodder for animals and high quality grain. There are no established marketing channels, and seed supply is limited or non-existent, so farmers who grow ricebean have to use their seeds from the previous year.

Ricebean and similar species are known as ‘orphan’ or ‘underutilised’ crops. These are defined as locally plentiful but globally rare, there is little scientific information and knowledge about them available and their current use is limited, relative to their economic potential (Gruère et al., 2007). Many of these orphans have a high potential to be improved by breeding as a mean of generating food and sustainable income for local producers and chain actors.

Ricebean, as an orphan crop, has received little scientific attention, so no enhanced varieties exist. It has fallen far behind the major pulses regarding area and produced quantity in India and Nepal. Disadvantages such as low yield and high labour inputs in comparison to, for example, green gram (V. radiata) and black gram (V. mungo) have resulted in a decrease of the area planted with ricebean. In earlier documents we described the development of a Hedonic Price Function (Buergelt et al., 2010a) to categorise the value of particular traits to consumers, and of an index, the Consumer Preference Index (CPI), which can be used by plant breeders to put a monetary value to the traits for which they are breeding, and so target consumer preferences directly (Buergelt et al., 2010b). Other documents in this series describe ricebean’s distribution in Nepal and India (Gautam et al., 2007), indigenous knowledge on the crop (Khanal et al., 2009), molecular aspects (Bajracharya et al., 2008) and its importance in diets and nutrition (Andersen, 2007; Andersen et al., 2009).

Provided that breeders succeed in developing an improved variety that combines higher yields with the characteristics desired by consumers, a second necessary step would be to introduce such an improved ricebean into pulse markets. A precondition for a successful product introduction is a well-designed marketing strategy. Such a strategy in turn, must be based on a thorough analysis of the marketing system by which ricebean would be moved from producer to consumers. This includes the characterization of agents at every stage, identification of key transaction practices, and marketing conditions. Moreover, market intelligence should reveal where product value is lost on the way from farmer to consumer, and where costs of transport, storage and transactions may be saved.

An agricultural marketing system can be loosely defined as the activities and processes involved in moving a commodity from farmers to consumers. The pulse marketing systems in India and in Nepal are known to be fragmented, complex, and even chaotic (World Bank, 2008). This suggests that no single theoretical perspective would be sufficient for describing and analysing the Indian and Nepalese marketing systems adequately. Therefore, four perspectives were selected in the hope of accommodating the complexity. These were

(i) marketplaces,
(ii) market channels,
(iii) supply chains and networks, and
(iv) generalized markets.
Each of the perspectives involves key concepts that have guided our empirical analysis of pulse markets. The concepts are not perfectly separated from each other, and some overlap. Therefore, the key concepts were consolidated into what we call a ‘toolbox’, which represents a comprehensive perspective for analysing and describing the marketing system for pulses in India and Nepal.

Ricebean is grown in remote areas where semi-subsistence consumption prevails. Therefore, we start our analysis of the marketing system with the situation where marketing does not occur, or occurs only on a very small scale. We assume that farmers produce a surplus which they sell on local markets. Marketplaces are the first perspective of our toolbox. This section also introduces transaction costs, which always go along with exchange and trade.

Food products like pulses usually pass through several hands until they reach the final consumer. Thus, marketplaces are often only one stage along the pathway of products from farmers to consumers. The whole sequence of marketplaces, market intermediaries, processors and hawkers may be regarded as a channel. Members of channels are usually treated as anonymous to each other because their relation is only transaction based, and relations that go beyond transactions are not considered here. Further, the identity of individuals is not considered. Persons are allocated into stages based on their function. These stages are connected by the product flow, but make autonomous decisions.

An advanced perspective to consider the route to market is through supply chains and networks, characterized by coordinated decisions between the various agents. In contrast to channels, supply chains consider relations that go beyond transactions. These relations are, for example, joint coordination and information exchange. The last perspective of our toolbox is the generalized market view. This does not involve flows of products and information. Information is transferred by prices and as in the channel perspective all agents are treated as anonymous.

The toolbox we used was applied in two steps. First, the total sector in India and Nepal was investigated because this is the environment in which an improved ricebean variety will have to be marketed. In the second step, additional information about the ricebean marketing system was collected. For that purpose, interviews with Indian and Nepalese ricebean farmers and intermediaries were carried out in 2008 and 2009. Finally, we summarise the key results and insights, and provides suggestions for the marketing of ricebean.

2. Markets and marketing options for ricebean

2.1 Frameworks for market description and analysis

In this section the four perspectives that we use to analyse the agricultural marketing system are presented: marketplaces, market channels, supply chains and networks, and the generalized market. Table 1.1 gives an overview of the perspectives and their core observable characteristics.

Description always requires selection of the traits or characters to be described (Sen, 1982). The base for the selection of the characteristics listed in Table 2.1 has been an iterative process of knowledge accumulation over several periods. General knowledge about agricultural marketing systems was obtained from general market theory (Geertz, 1978; Landsburg, 2008; Varian & Buchegger, 2007) and from an informal review of studies of agricultural marketing systems in developing countries (Fafchamps et al., 2007, Jagannathan 1987, Mellor et al., 1968, Scott, 1985, 1995).
Specific information about the pulse and ricebean marketing systems in India and Nepal was obtained during field visits in 2008 and 2009. By switching repeatedly from theory and desk research to empirical field research both came more focused, our theoretical basis as well as our attention to specific details of the real-world pulse marketing system.

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<th>Table 2.1: Perspectives and their core characteristics</th>
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Our toolbox was then derived from the characteristics in Table 2.1. Subsequently, the toolbox was used to describe and analyse the complex agricultural marketing system for pulses.

Some characteristics such as prices, sales volumes and margins are common to all four perspectives. Others, such as transaction costs or weights and grades, are common to three perspectives, while others again are specific to only one.

Any agricultural marketing system starts with the production of commodities by farmers. Many farmers in developing countries are, however, subsistence or semi-subsistence farmers that are incompletely integrated into the agricultural marketing system. These farmers are the starting point for our discussion.
2.1.1 Subsistence households
Due to large distances to markets many ricebean growing farmers consume nearly all of their production. Schneider (1972) developed a model that analyses individual’s decision to keep or sell a product. We used this model to explain subsistence ricebean farming in India and Nepal. Consider a farmer who has harvested all his ricebean and who has to decide whether and how much to sell. The model is short-term because it considers only one production period. The farmer is representative and acts rationally. Transaction costs, costs of transport and the uncertainty regarding market prices are not considered. The model divides the total demanded quantity of a farm-produced good, such as ricebean, by the own-demanded quantity of the farmer and the demanded quantity of non-farmers. This shows how the quantity that is traded on the market varies with market prices.

**Figure 2.1:** Model of subsistence households (Schneider, 1972, p. 330)

The total quantity of ricebean produced by the farmer is shown by $q_{\text{max}}$ in Figure 2.1. The farmer is assumed to retain a minimum quantity for home consumption; this is equal to the difference of $q_{\text{max}}$ and $q_2$. The market supply of ricebean is represented by the curve $AA'$, which assumes that market supply rises with price up to the quantity of $q_2$. The kink in $AA'$ at $q_2$ represents the assumption that the quantity $(q_{\text{max}} - q_2)$ is always retained for home consumption. The market supply curve, $AA'$, of the farmer can also be interpreted as the inverse curve of the farmer’s own demand. The quantity of own demand is given by the difference between $AA'$ and $q_{\text{max}}$ and increases as the price decreases. The market demand by consumers other than farmers is shown by the curve, $NN'$, which slopes down to the right.

Figure 2.1 shows that the farmer would sell the quantity of $q_0$ for the price $p_0$ and he would keep $q_{\text{max}} - q_0$ which is represented by the horizontal line $SS'$. If the price rises from $p_0$ to $p_1$ the farmer would sell more ricebean and keep less for his own consumption. The farmer would increase the quantity supplied to the market up to $q_2$ for the price of $p_2$ but he would never sell more than $q_2$ even if the price rises above $p_2$. At $p_2$ the farmer supplies the maximum quantity he is willing to sell $(q_{\text{max}} - q_2)$ to the market. This implies that he keeps the minimum own demanded quantity of $q_{\text{max}} - q_2$. Thus, all prices below $p_2$ decrease the quantity supplied to the market and increase farmer’s home consumption.

The total demand is calculated by adding the farmer’s own demand and the quantity demanded by non-farmers. This is depicted by the curve, $N_1N_1'$, in Figure 2.1. The market clears at $p_0$, the intersection of total demand, $N_1N_1'$, and the vertical line $VR$ at the point $S'$. 
Note that VR indicates the total available amount of the relevant commodity (Schneider, 1972).

The following example shows how the distance to a market influences the quantity supplied to the market by subsistence farmers. Imagine two ricebean growing farmers F (1) and F (2). F (1) lives near to the market and F (2) lives far away – the different distances implying different transport costs to the market. Assume that F (1) has no transport costs due to closeness to the market and F (2) has transport costs equal to (p2-p0). F (1) would sell a quantity of q2 at the market price p2; F (2) would only sell the smaller quantity of q0 because he has to reduce the net market price p2 by the transport costs. Thus, he actually sells for p0.

Schneider’s (1972) model shows how farmers distribute their production among own demand and the market demand of non-farmers depending on the price. This model is essential for the ricebean trade in India and Nepal as the trade starts with subsistence farmers.

2.1.2 Marketplaces

Section 2.1.1 highlighted the determinants of farmer’s decisions to sell or not to sell their produce. We now assume that farmers are actually selling some or all of their products which lead us to the perspective of marketplaces.

A marketplace can be described as a public gathering at a certain location where people meet at a certain time to buy and sell (Porter, 1995). Marketplaces are usually described in terms of location, frequency, activities of traders, physical and institutional infrastructure. Depending on their location, marketplaces in developing countries are often classified into village, assembly, and urban markets. Village markets, also referred to as rural or primary markets, are used by farmers to sell their commodities directly to consumers or village traders. In village markets only small quantities of a commodity are traded. Assembly markets are frequented by farmers and wholesalers who trade large amounts of commodities. In urban markets, commodities are traded at the retail or wholesale level.

The frequency of markets can be periodic, e.g. once a week or they can be permanent. Most rural and assembly markets are periodic, with the periodicity occurring on a fixed interval of days for each market. Urban markets are mostly permanent (Tracey-White, 2003).

The main activities of farmers and traders in markets are information gathering, price negotiation, measuring, inspecting, buying, and selling. Further, activities not directly linked to transactions are conducted, such as assembling, cleaning, processing or packaging products (Scott, 1985).

The physical infrastructure of marketplaces includes, for example, roads, cold storage facilities, stalls, grading machines, access to telephones, electricity, water, drainage, public toilets, and pest control (Fafchamps et al., 2007). The institutional infrastructure includes market rules, market policy that enforces rules, and the usage of standard weights grades.

In this study we go beyond the pure description of marketplaces by explaining that marketplaces are arrangements that reduce trading costs. From the economic point of view, “Markets exist to facilitate the transfer of ownership of goods from one owner to another” (Colman & Young, 1989, p. 167). Trading is facilitated if trading costs – transaction costs, transport costs, handling and processing costs, and storage costs – are reduced.

Transaction costs occur when property rights to a product are exchanged. Coase (1937) recognized that there are costs to using the market mechanism. Demsetz (1968) defined a transaction cost as: “the cost of exchanging ownership titles”. Dahlman (1979) classified transaction costs into search and information costs, negotiation and decision costs, and monitoring and enforcement costs. Barzel (1982) analysed transaction costs in regard to
measurement costs, which occur when the quality attributes of goods are determined through inspection. He argued that if information were costless, attribute levels and defects could be identified effortlessly at the time of transaction. However, product information is costly and attained only by measuring an attribute’s levels.

Descriptive market characteristics that influence transaction costs are, for example, the price finding mechanism, the concentration in time of buyer and seller, and the usage of standard measures, grades and labelling.

There are three general price finding mechanisms. One is posted prices. If traders post the prices of their products, they provide important information to customers and suppress price negotiation, which reduces transactions. The second mechanism is auctions, held in marketplaces to facilitate quick price finding. Auctions are important if large amounts of perishable products have to be sold. The dominant price finding mechanism in marketplaces in India and Nepal is bilateral bargaining (Wang, 1993, Bester, 1993). The influence of this on transaction costs is linked to the numbers of sellers and buyers.

Limiting markets to be open only during certain periods, such as a set weekday, may also help to reduce traders’ transaction costs. This effect, which we explain in more detail below, is likely to be particularly important in markets attended by small numbers of traders and where periodic trading helps to concentrate the few. The impact of periodic trading can be explained with a model for markets with small numbers of buyers and sellers. When the numbers of traders attending a market at a given place and date are small, the supply and demand curves that represent traders’ willingness to buy and sell are not smooth curves. Rather, the curves involve steps that represent the differences between buyers’ willingness-to-pay and sellers’ willingness-to-accept (Varian & Buchegger, 2007).

The price on which traders will settle is then indeterminate and must be found in bilateral price negotiations. Negotiations require time and are a transaction cost and it is reasonable to expect that the transaction cost increase with the difference between a sellers’ willingness-to-accept and a buyers’ willingness-to-pay. This negotiation zone is likely to be the larger the smaller is the number of traders attending a marketplace in a given trading period.

Figure 2.2 represents a market with small numbers of buyers and sellers. The market consists of four sellers S(1) – S(4) and four buyers B(1) – B(4). Seller (1) is prepared to sell 2 units of the good if the price equals 1 or higher; similarly seller (2) is prepared to sell 2 units for a price \( p \geq 2 \). The demand curve which represents the buyers’ willingness-to-pay for certain quantities is similarly constructed. This market would clear when 4 units of the good are traded at a price from the range \( 2 \leq p \leq 4 \). At \( p = 2 \) suppliers S(1) and S(2) would provide buyers B(1), B(2) and B(3) with 4 units, and no rents would accrue to seller S(2). At price \( p = 4 \), in contrast, no rents would accrue to buyer B(3). In this case the negotiation zone would be determined by the willingness-to-pay of buyer B(3), the marginal buyer, and the willingness-to-accept of seller S(2), the marginal seller.

If an additional seller S(+) joins this market who is prepared to sell one unit of the good at price \( p = 3 \) three changes ensue. First, the demand by the marginal buyer can now be fully satisfied. In consequence, the total quantity traded increases from 4 to 5 units. Moreover, the negotiation zone shrinks from 2 price units to 1 unit. It is plausible to expect that traders will, in general, find a mutually agreed price more quickly when the negotiation zone is reduced. We therefore expect that transaction costs, which include the opportunity cost of the time spent on price negotiation, will be reduced when the number of traders present at a marketplace is increased because of limits on the periods when a market is open for trading.
Transaction costs are further influenced through the use of grades, standard weights, and labels. Information about product quality is attained through inspection, leading to measurement costs, so an increase would raise transaction costs. Measurement costs are reduced if quality standards in the form of grades are used. Grades transfer accurate information that decreases consumers’ efforts for measurement and inspection (Barzel, 2002).

The gathering of information about the product quantity is improved if standardized weights are used. Measures such as volume units (cups, tins) are not easy to compare if different sellers use different volume units, and weights in the form of stones imply more inspection for consumers. In both cases, consumers are faced with higher transaction costs because the restricted comparability of volume units hampers the gathering of information, and non-standardized weight units require more inspection. Thus, transaction costs are reduced if standard weights are used in markets.

The labelling of products with a brand name that is built on the reputation of the producer, serves as guarantee for product quality, so the measurement costs for buyers are reduced or even eliminated. As the brand name can be used for several transactions of the product, from farmer through wholesaler and retailers to consumer, measurement costs are eliminated several times. Thus, the transaction costs are also reduced (Barzel, 1982).

Transport costs are reduced because marketplaces gather people at one place. The advantage of such a centralized exchange has over decentralized exchange is obvious from Figure 2.3. Panel (a) of Figure 2.3 shows a decentralized exchange between five farmers (A-D) from different villages. Each is assumed to offer a different commodity and each farmer desires all of the five commodities produced. If they want to exchange products they have to travel to the respective village of the farmer who produces the desired produce. The sum of the necessary exchanges of five farmers is calculated as: \(0.5 \cdot n \cdot (n-1)\), where \(n\) denotes the number of farmers. Thus, the decentralized exchange in panel (a) requires 10 exchanges, each with associated transport costs. However, if all the farmers were to gather in one location e.g. a marketplace at farmer A, they would reduce the number of necessary exchanges to \(n-1\), which is equal to 4. This is shown in panel (b) of Figure 2.3. Thus marketplaces reduce the number of exchanges needed, and thus the transport costs.

Figure 2.2: Impact of few buyers and sellers.

The ricebean network: introducing ricebean to the supply chain
Another advantage of periodic markets is that they are spatially distributed and so reduce travelling distances. A short distance to markets implies that many people can attend, making the market attractive for traders and buyers (Eicher & Baker, 1992). Consequently, short distances to market reduce transaction costs by attracting a large number of traders.

Handling costs are reduced if markets offer a physical infrastructure that prevents post-harvest losses. These occur due to the perishable nature of agricultural products, and to handling practices. Market infrastructure could reduce losses by providing a sanitary environment and facilities as refrigerators for cooling to maintain product quality. Market stalls remove the need for sellers to put food products on the dirty ground, and protect products against the sun. Drainage, pest control and public toilets provide a sanitary environment which also prevents losses. Access to telephones supplies an important source of information about prices and potential purchasers, which reduces the lead time of products to reach the final consumer (Fafchamps et al., 2008). Roads improve access to markets, which goes along with decreased time and better conditions for transport. This reduces both handling and transport costs (Jacoby, 2000).

Storage, to carry-over periodic market surpluses, is associated with losses and costs. Storage losses of agricultural products average around 25%, but range from 3% to 40%. Storage costs are influenced by the storage form (granaries, bag warehouses, silos) and the stored product (Eicher & Baker, 1992). Marketplaces reduce or eliminate storage costs because farmers can sell surpluses that exceed their home consumption instead of storing these products.

Marketplaces are one of four perspectives used to develop the toolbox, which we will use to analyse the agricultural marketing systems. The perspective of marketplaces includes three characteristics that all perspectives have in common: the prices of the traded commodities, the sales volumes, and the margins received by traders. Beside these, the following characteristics of the marketplace perspective are considered for our toolbox:

- transaction costs,
- standard weight & grades,
- number of buyers and sellers,
- infrastructure,
- type,
- frequency,
- price finding mechanism,
- activities of traders.
2.1.3 Market channels

The second perspective, market channels, expands the marketplace perspective by including all stages along the way from farmer to consumer. Their analysis provides a systematic knowledge of the flow of goods and services from their origin (farmer) to their final destination (consumer) (Mendoza, 1995). The channel perspective treats trading partners as anonymous, and relationships that go beyond product exchange are not considered.

Usually, the analysis of market channels involves the identification of agents, merged into stages based on similar functions. The stages, also referred to as levels or tiers, involved in handling agricultural commodities are typically farmers, retailers, wholesalers, brokers, commission agents, processors, and consumers. Government agencies may also be involved, e.g. those that provide market information, implement commodity grades and enforce regulations (Rhodes, 1983). Channels can be visualized in form of a flowchart with two main flows: the product flow from farmers to consumers; and the flow of money in the opposite direction from consumers to farmers (Stern et al., 1996; Bowersox et al., 1980). Figure 2.4 presents some simplified market channels as a product flow chart. The channel configuration may vary between products, locations, usage of products and time (season).

![Figure 2.4: Product flow in market channels (McCarthy, 1968)](image)

Each stage of the channel performs important marketing functions (Acharya & Agarwal, 2004), which are mainly functions shown in Table 2.2. Detailed information about marketing functions and different classifications of these functions are provided by Thomsen, 1951; Converse et al., 1959; and Kohls & Uhl, 1985. The exchange functions of buying and selling, are activities directly involved in the transfer of titles to goods. The physical functions of storage, transport, processing and packaging are necessary to handle, move and transform products. The facilitating functions permit smooth, cost saving performance of exchange and physical functions. The individual functions of Table 2.2 are not always linked to a particular stage and some may be carried out at several stages, e.g. buying, selling, transport, and storage. Others may be carried only once, e.g. packaging and processing.

<table>
<thead>
<tr>
<th>Exchange functions</th>
<th>Physical functions</th>
<th>Facilitating functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buying</td>
<td>Storage</td>
<td>Standardisation &amp; grading</td>
</tr>
<tr>
<td>Selling</td>
<td>Transport</td>
<td>Financing</td>
</tr>
<tr>
<td></td>
<td>Processing</td>
<td>Risk bearing</td>
</tr>
<tr>
<td></td>
<td>Packaging</td>
<td>Market intelligence</td>
</tr>
</tbody>
</table>

Source: Rhodes 1983
In carrying out these functions, agents compensated financially because they add value to the product. Thus, each stage of a channel is associated with a mark-up on the farm price that increases with each stage it passes (Mendoza, 1995). The sum of all mark-up along a channel from farmer to consumer is the farm-retail price spread or the total marketing margin. The margin includes marketing costs and additional income (Shepherd & Futrell, 1982).

Once the marketing costs are identified, it is possible to assess the efficiency of a channel. An efficient marketing system, such as a channel, is able to move goods from producer to consumer at the lowest costs and provides goods and services that consumers demand. Thus, the identification of marketing costs is necessary to determine where costs can be reduced to make a market channel more efficient (Crawford, 1997).

It is plausible that the reduction of trading costs, discussed in connection with marketplaces, would also lead to an efficient channel. Acharya (2004) and Crawford (1997) identified several factors that influence marketing costs and efficiency.

(i) Highly perishable products are associated with higher marketing costs. The marketing costs of perishable products may be reduced if physical infrastructure and facilities, such as cooling, are available.

(ii) Marketing costs are incurred when losses occur and when quality deteriorates during storage and transportation. This could be avoided by a physical infrastructure that facilitates proper storage and transport. Storage could be improved by ensuring a sanitary environment or through pest control in granaries, warehouses and silos. Losses during transport could be reduced by, for example, direct access to roads to reduce transport time and the need for trans-shipment.

(iii) The lower the extent of grading the higher the marketing costs. Without grading, the costs of determining product quality rise for buyers and sellers alike and transaction costs increase. Grading and the use of uniform grades over the whole channel would decrease marketing costs and improve channel efficiency.

(iv) Irregular supply of a commodity increases per-unit marketing costs because a seasonal supply, typical for agriculture, requires storage. Storage would be necessary to secure product availability throughout the year. Storage, however, has costs, including some product losses.

In summary, the market channels perspective adds these elements to the toolbox:

- stages and their functions,
- sequence of stages,
- marketing costs,
- uniformity of weights and grades,
- flows of product & money.

In addition, the channel perspective might also be useful for identifying those stages at which value could be added by processing or grading.

2.1.4 Supply chains
Supply chains and the previously presented perspective of market channels are both concerned with the flow of a product from its source to the final consumer. This is apparent from Trent’s (2004) definition: “A supply chain is a set of three or more organizations linked directly by one or more of the upstream or downstream flows of products, services, finances, and information from a source to a customer”.

The main difference between channels and supply chains is that agents in supply chains coordinate their decisions and actions. The coordination of all agents from farmer to consumer requires management, referred to as supply chain management (SCM). “Supply chain management then, involves proactively managing the two-way movement and coordination (that is, the flows) of goods, services, information, and funds from raw material through end user” (Trent, 2004). Improvements through SCM are realized by saving costs through leaner inventory and shorter lead times while serving high quality products and services for the end customer (Evans et al., 1995). SCM is also an instrument that facilitates the traceability of commodities from the producer to the final consumer (Gaml, 2006).

The improvement of coordination through information exchange over several stages was first shown by Forrester (1961), who demonstrated that small variations in the demanded quantity can induce a large increase in variation of demanded quantities on subsequent stages of the supply chain. This effect, referred to as bullwhip-effect, occurs due to time lags and to the autonomous decisions of agents in a chain without coordination through information exchange. When information is unavailable each agent has an incentive to keep a safety stock that buffers unexpected changes in the quantity demanded (Lee et al., 1997).

SCM requires firms to coordinate their actions, so that their relations go beyond those of pure exchange. The range of vertical coordination reaches from strategic alliances and contracts over quasi-vertical integration and tapered vertical integration to full vertical integration (Sporleder, 1992). This allows many transaction costs to be avoided (Hobbs, 1996). However, vertical integration also involves coordination costs for administration and organization. Thus, firms should coordinate their actions if the costs of coordination are lower than transaction costs.

SCM contains three core elements: the supply chain configuration, the supply chain business processes, and the supply chain management components (Lambert & Cooper, 2000). The configuration of a supply chain is less a chain than a network. It contains all types of firms on each stage and the links between these firms. The supply chain configuration includes the number of all stages involved, and the number of agents at each stage. Stages included could be farmers, transport companies, wholesalers, retailers and the final consumers (Lambert & Cooper, 2000).

An instrument to analyse the configurations of supply chains is a network model based on graph theory. "A social network consists of a finite set or sets of actors and the relation or relations defined on them." A relation is the "collection of ties of a specific kind among members of a group" (Wassermann & Faust, 1994, p. 20). Applying network models and the connected SNA on supply chains provides: network diagrams, quantitative measures that describe network-related attributes of individual network members, and quantitative and qualitative measures of the whole network (Müller et al., 2007).

The second core element of supply chains is business processes. Typical for the supply chain perspective is a view of the entire chain as a set of interrelated processes intended to achieve some shared objectives. Processes are, for example, product development, order fulfilment or procurement. Supply chain processes can cross inter-and intra organizational boundaries, and do not have to be confined to one firm only (Cooper et al., 1997a).

The third core element of supply chains is the management component – variables that can be affected by the management and thus integrate processes into the entire supply chain. Lambert & Cooper (2000) identified nine of these:

- planning and control,
- work structure,
• organization structure,
• product flow facility structure,
• information flow facility structure,
• management methods,
• power and leadership structure,
• risk and reward structure and
• culture and attitude.

Cooper and Ellram (1993) developed a comparison (Table 2.3) between traditional market channel management and SCM. Since our toolbox also includes market channels and SCM, a comparison would emphasise differences in the autonomous decisions in channels between anonymous agents to coordinated exchanges in supply chains.

<table>
<thead>
<tr>
<th>Element</th>
<th>Traditional channels</th>
<th>Supply chains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory management</td>
<td>Independent</td>
<td>Channel-wide</td>
</tr>
<tr>
<td>Total cost approach</td>
<td>Minimize firm cost</td>
<td>Channel-wide cost efficiencies</td>
</tr>
<tr>
<td>Time horizon</td>
<td>Short term</td>
<td>Long term</td>
</tr>
<tr>
<td>Amount of information sharing and</td>
<td>Limited to needs of current</td>
<td>As required for planning and monitoring processes</td>
</tr>
<tr>
<td>monitoring</td>
<td>transactions</td>
<td>Multiple contacts</td>
</tr>
<tr>
<td>Coordination</td>
<td>Single contact for transaction</td>
<td>On-going</td>
</tr>
<tr>
<td>Joint planning</td>
<td>Transaction based</td>
<td></td>
</tr>
<tr>
<td>Compatibility of corporate</td>
<td>Not relevant</td>
<td>Compatible at least for key relationships</td>
</tr>
<tr>
<td>philosophies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breadth of supplier base</td>
<td>Large to increase competition and</td>
<td>Small to increase coordination</td>
</tr>
<tr>
<td></td>
<td>spread risk</td>
<td></td>
</tr>
<tr>
<td>Channel leadership</td>
<td>Not needed</td>
<td>Needed for coordination focus</td>
</tr>
<tr>
<td>Sharing of risks and rewards</td>
<td>Each on its own</td>
<td>Shared over long time</td>
</tr>
<tr>
<td>Speed of operations</td>
<td>“Warehouse” orientation</td>
<td>“Distribution Centre” orientation</td>
</tr>
<tr>
<td></td>
<td>interrupted by company barriers</td>
<td>interconnecting flows</td>
</tr>
</tbody>
</table>

Source: Cooper & Ellram, 1997

The inventory in a traditional market channel and storage levels are planned independently by every company. The supply chain approach uses a chain-wide inventory management to reduce redundant inventories which is the main difference of both approaches. The costs should also be reduced over the whole chain. The evaluation of costs is done chain-wide because some chain members may have conditions, rates or taxes which generate competitive advantages for the whole chain.

The time horizon of supply chain relations is extended in comparison to channels. Relationships in channels are short termed because they are finished with the transaction. SCM requires a longer time horizon because the coordination often involves additional investments in information and operation systems. These investments for cooperating are only profitable for a period that lasts longer than the transaction.

Information sharing and monitoring is crucial in supply chains, as the cost of information search are reduced and therefore transaction costs are reduced too. The information should flow down the chain from producer to consumer and upwards in the opposite direction (Cooper & Ellram, 1993). The amount and focus of coordination is different in channels and supply chains. Coordination in channels is focused on single transactions between buyer and seller. SCM implies that all agents of the chain coordinate their activities. Thus, there are more contacts of different management levels of functions and the contacts are more frequent compared to traditional channels (Cooper et al., 1997b).
Joint planning in the supply chain goes beyond the scope of single transactions and delivery times between neighboured companies in a channel. It develops over years, affects processes like material flow or product development, and involves many members of the chain. The compatibility of corporate philosophies (Table 2.3) refers to agreements on the basic direction of the supply chain. Compatibility eases coordination and long term relationships. Members in traditional channels often have a wide breadth of supplier base, to increase competition and decrease the risk of missing products if one supplier cannot deliver. SCM implies a reduced breadth of suppliers to achieve closer management and coordination of fewer relationships (Cooper & Ellram, 1993). Whether a supply chain needs to nominate a leader, referred to as chain captain (Cooper & Ellram, 1993), or if firms get a leading role due to their size or economic power (Mentzer et al., 2001) is still discussed in the literature.

The sharing of risks and rewards over a period longer than a transaction requires close relationships and the willingness to achieve a win-win situation for every agent. This is implied in the approach of SCM. Traditional channels cannot balance risks and rewards because the relationships are short termed and the agents act relatively independent and opportunistic (Cooper & Ellram, 1993). SCM employs risk prevention practices such as quality certification, supplier development, and improved forecasting. Further, risk managing practices such as having many supply sources and safety stocks are noted in the literature (Trent, 2004), but these practices are contradictory to the small breadth of the supplier base and lean inventory of SCM (Cooper & Ellram, 1993).

In summary, the contribution of SCM and supply networks to our toolbox is presented. Like all other perspectives, SCM also involves product prices, sales volumes and margins. Further, transaction costs are considered because the agents in a supply chain co-operate in order to reduce transaction costs. Standard weights and grades for agricultural commodities are also important to reduce the costs of inspection and consequently the transaction costs over the whole chain. The analysis of the agricultural marketing systems from the supply chain and network perspective adds the following objects to the toolbox:

- type and number of agents,
- type and number of links among agents,
- processes and their coordination,
- cost and inventory management among agents,
- distribution of benefits and risks,
- permanence of co-operations.

Additionally, data from the social network analysis could reveal for example unimportant agents, important information multipliers or bottlenecks where information stops. This would be important for the introduction of a new ricebean variety. The presence of coordination activities (e.g. inventory, costs, information exchange, planning) might facilitate the distribution of an improved variety, while handling practices to reduce transaction costs and quality losses or to add value could be implemented over the whole chain.

2.1.5 Generalized market

The generalized market view can be seen as the perspective that includes the marketplaces, channels and supply chains and networks. Like in market channels, involved agents are treated anonymous to each other. In generalized markets all information is comprised in prices. A market is ruled by the laws of supply and demand. Supply is the relationship between varying quantities offered for sale at changing prices at a certain time and location (Kohls & Uhl, 1985). A special feature of agricultural products is that the production that is supplied to the market is sometimes reduced by the share for home consumption (section 2.1.1). The quantity supplied by farmers minus the share for home consumption is the
marketed surplus. Demand is the relationship between purchased quantities of a product and the price of that product. For ordinary goods, the lower the prices the more will be bought (Kohls & Uhl, 1985).

Domestic supply and demand and consequently also domestic product prices are affected by imports from, and exports to, foreign markets. Imported and exported products can have an influence on domestic prices because they affect quantities supplied and demanded.

The relation between varying commodity prices and varying quantities supplied or demanded is captured through the price elasticity of supply and demand. In general, elasticities express consumers’ and producers’ reaction to price changes for single products. By definition, a elasticity is the proportionally change of the quantity supplied or demanded divided by the proportional price change. Values above 1 indicate elastic supply and demand whereas values below 1 indicate inelastic supply or demand (Samuelson & Nordhaus, 1998). The income elasticity reflects the change in demand when consumers’ incomes change. Income elasticities of necessary commodities are quite small because people have to buy these, whatever the price is. Luxury goods in contrast, have high income elasticity. Another category of goods are inferior products. The demanded quantity of inferior goods decreases with increasing income (Mankiw, 1999). The cross price elasticity of demand reveals whether two products are substitutes (value >1), like tea and coffee or complementary goods (value < 1) like tea and sugar (Koester, 2005).

There are several factors that influence prices of agricultural products. One is the government that influence farm prices through price supports, controls and trade policies. Examples are price ceilings and price floors. These, instruments prohibit by law that markets prices fall below floors or rise above ceilings. Price floors, such as the minimum support price in India, are used to support farm prices and farmer’s income. Both, floors and ceilings set a price at which the market will not be cleared. Price floors, are usually higher than the market price and will lead to more supply than demand. Price ceilings are below market prices and lead to a higher demand (Kohls & Uhl, 1985).

Additionally, agricultural prices often show pattern such as price cycles and seasonal price variations. Agricultural price cycles are regular price variations induced through cyclic increase and decrease of agricultural supply. Seasonal price variations are regularly caused by seasonality of demand, production and marketing (Rhodes, 1983). Seasonal price changes occur, e.g. when farmers sell all crops right after harvest. The abrupt increase of the supplied quantity results in decreasing prices (Kohls & Uhl, 1985).

The price formation referred to as pricing in markets is influenced through market forms which also reflect the strength of competition. Perfect competition implies, among other characteristics, a large number of buyers and sellers. Thus, type and strength of competition is affected by the number of sellers and buyers in a market (Rhodes, 1983). Stackelberg (1952) introduced a classification of markets shown in Table 2.4. The classification is based on the number of sellers and buyers (Koester, 2005).

<table>
<thead>
<tr>
<th>Buyer</th>
<th>Many</th>
<th>Few</th>
<th>One</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many</td>
<td>Polypoly</td>
<td>Oligopsony</td>
<td>Monopsony</td>
</tr>
<tr>
<td>Few</td>
<td>Oligopoly</td>
<td>Oligopoly bilateral</td>
<td>Monopsony limited</td>
</tr>
<tr>
<td>One</td>
<td>Monopoly limited</td>
<td>Monopoly</td>
<td>Monopoly</td>
</tr>
</tbody>
</table>

Source: Koester, 2005
Analysing and describing the agricultural marketing systems from the generalized market perspective would add following characteristics into the toolbox:

- quantity supplied,
- quantity demanded,
- imports/exports,
- elasticities,
- market form,
- taxes, tariffs, regulations, and subsidies
- price developments and price pattern.

### 2.2 The toolbox

We are now in a position to use the toolbox, based on the perspectives described above, to analyse and describe the complex agricultural marketing systems in India and Nepal. The toolbox includes observable characteristics from all four perspectives and is shown in Table 2.5. It was applied in two steps. First, the marketing system of pulses in India and Nepal was investigated, because if an improved ricebean variety will be developed it will have to be marketed in this sector. Therefore, scientific literature, information from governmental publications and websites, and data basis were reviewed.

In a second step additional information about ricebean marketing systems was collected by means of interviews. The interviews were carried out with Indian and Nepalese ricebean farmers and intermediaries in the years 2008 and 2009.

The use of the toolbox in this way will be described in Section 3.
### Table 2.5: Toolbox to analyse and describe the agricultural marketing system in India and Nepal.

<table>
<thead>
<tr>
<th>Marketplace</th>
<th>Channel</th>
<th>Supply chain &amp; network</th>
<th>Generalised market</th>
<th>Toolbox</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>------------------------</td>
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</tr>
<tr>
<td></td>
<td>Prices</td>
<td></td>
<td>Prices</td>
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<tr>
<td></td>
<td>Sales volumes</td>
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<td>Sales volumes</td>
<td></td>
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<tr>
<td></td>
<td>Margins</td>
<td></td>
<td>Margins</td>
<td></td>
</tr>
<tr>
<td>Transaction costs</td>
<td>Transaction costs</td>
<td>Transaction costs</td>
<td>Transaction costs</td>
<td></td>
</tr>
<tr>
<td>Weights and grades</td>
<td>Uniform weights and grades</td>
<td>Uniform weights and grades</td>
<td>Uniform weights and grades</td>
<td></td>
</tr>
<tr>
<td>Marketing costs</td>
<td>Costs management</td>
<td></td>
<td>Marketing costs and management</td>
<td></td>
</tr>
<tr>
<td>Flows of products and money</td>
<td>Type and number of relations</td>
<td></td>
<td>Flow of products, money, information as relations</td>
<td></td>
</tr>
<tr>
<td>Numbers of buyers and sellers</td>
<td>Numbers of buyers and sellers per marketplace</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Type of marketplaces</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>Frequency of marketplaces</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infrastructure &amp; facilities</td>
<td>Infrastructure of marketplaces</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price finding mechanism</td>
<td>Price finding mechanism</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activities of traders</td>
<td>Activities of traders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stages/ levels/ tiers</td>
<td>Stages</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence of stages</td>
<td>Sequence of stages</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Functions of stages</td>
<td>Functions of stages</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type &amp; number of agents</td>
<td>Type &amp; number of agents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process coordination within the chain</td>
<td>Process coordination within the chain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory management</td>
<td>Inventory management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution of benefits, risks</td>
<td>Distribution of benefits, risks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leader (chain captain)</td>
<td>Leader (chain captain)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanence of co-operation</td>
<td>Permanence of co-operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply</td>
<td>Supply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demand</td>
<td>Demand</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Import/ Export</td>
<td>Import/ Export</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elasticities</td>
<td>Elasticities</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Taxes and tariffs</td>
<td>Taxes and tariffs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price developments &amp; pattern</td>
<td>Price developments &amp; pattern</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market form</td>
<td>Market form</td>
<td></td>
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</tbody>
</table>
3 The market for ricebean: A niche market embedded in the market for pulses

3.1 The marketing system of pulses in India and Nepal

3.1.1 Pulse market and marketing in India

India is the largest producer, consumer and importer of pulses in the world (Chandrashekhar, 2007). India accounts for 25% of the global pulse production and 27% of the global pulse consumption (Price et al., 2003). 60% of the agricultural land is rainfed, on which oilseeds and coarse cereals are grown as well as pulses (Government of India, 2006a). Usually pulses are only grown in one of the two seasons, *kharif* (May to October) or *rabi* (November to April) season. Pigeon pea, black gram, green gram, horse gram and ricebean are grown in the warm, rainy *kharif* season. Legumes of the cold *rabi* season are chickpea, lentil and dry peas (Price et al., 2003). Four-fifths of Indian farmers save seeds from their last harvest to use in the next season, so most farmers do not buy improved plant varieties from seed companies.

Of the total agricultural land, 11% is used for pulse production. Pulses are produced on 23.86 million hectares (M ha) and 15.12 million tonnes (M t) were harvested in 2007 (Government of India, 2008). The most important pulses are chickpea with an area of 7.58 M ha and a production of 6.91 M t, pigeon pea with 3.79 M ha and 3.09 M t and lentil with 1.47 M ha and 0.91 M t. The area grown and quantity of pulses produced has changed little since 1990.

The proportion of pulses that farmers sell is referred to as the marketed surplus ratio (MSR), and varies greatly between crops. For example, in 2005-06 chickpea growing farmers sold an estimated share of 94% and kept just 6% for home consumption, while farmers who grow black gram and green gram only sell about half of their produce (Government of India, 2008).

![Figure 3.1](image_url)  
**Figure 3.1:** Indian States, showing Madhya Pradesh (14), Uttar Pradesh (26) and Maharashtra (15) (Wikipedia, 2010)
Madhya Pradesh, Uttar Pradesh and Maharashtra are the three most important pulse production states in India, with between 18.5 and 20% of total production (Government of India, 2004a). Madhya Pradesh, Uttar Pradesh, and Maharashtra are labelled with the numbers 14, 26 and 15, respectively (Figure 3.1).

Domestic pulse production does not meet demand, and India has been a net importer of pulses since 1990 (FAOSTAT, 2010). India’s share in world imports of pulses ranges between 4 and 12%. Since 1999 there are no longer quantitative restrictions on imports, and they are regulated by tariff rates which have varied between 5 and 10%. In 2002-03 the import duty was 10% (Sathe & Agarwal, 2004).

Pulses are an important source of protein in a low income country like India where a large proportion of the population are vegetarians. Pulse dishes include *dal* (a thick gravy-like soup), *samosa*, *pappad*, *pakora*, *idli* and *dosa*. Indians in rural areas spend about 55% of their expenditure on food, and 5% of all food expenditure on pulses, while people in urban areas spend just 4% of their food expenditure on these items (Government of India, 2006b).

The Indian population is growing every year at about 1.6%, whereas pulse production is stagnating or declining (Ali & Kumar, 2007). Although pulses are imported to India their net availability, defined as gross production - seed, feed and waste - exports + imports and +/- change in stocks, has decreased. The Survey “Agricultural statistics at a Glance” (Government of India, 2004b) reports a steady decrease in the net availability of pulses. In 1951, 60.7 g of pulses were available for each person per day, but in the recent past (2001 to 2003), this declined to 31.4 g per capita per day.

![Figure 3.2: Nominal producer pulse prices in India (INR / kg), 1991-2006 (FAOSTAT, 2010)](image)

According to FAO’s definition, ricebean is included under “bean, dry” under its previous designation *Phaseolus calcaratus*. It shows that farm-gate pulse prices have increased since 1991 (Figure 3.2). The price of the ricebean, taken as that for “beans, dry”, increased from 5.98 Indian Rupees (INR) per kg in 1991 to 17.08 INR/kg in 2007, and is still increasing. It is plausible that insufficient domestic production is associated with the increasing price of pulses.
In general the demand for pulses is positively correlated with income. Kumar (2007) calculated an income elasticity of 0.2 for pulses in India. That means that if income increases by 1% then demand for pulses rises by 0.2%. But despite rising incomes, the consumption of pulses *per capita* is decreasing, which can be explained by their increasing prices. Indian consumers are very price-sensitive, as show by the price elasticities of demand in Table 3.1. In particular, very poor people (group I) in both rural and urban areas decrease pulse consumption by 0.8% when prices increase by 1% (Mittal, 2006).

Table 3.1: Own price elasticities of demand.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>Pulses</td>
<td>-0.775</td>
<td>-0.686</td>
</tr>
</tbody>
</table>

I: very poor, II: moderately poor, III: non-poor lower, IV: non-poor higher

Source: Kumar 1998 after Price 2003

Table 3.2 shows that the pulse consumption declined by 0.9% per year from 1980-2000, which could be in part be explained by a price increase of 2.1%. The prices of wheat and rice also increased but at much lower rates (0.4 and 0.5% respectively).

Table 3.2: Annual growth rates of pulse prices and consumption in comparison to other commodity prices, 1980-2000.

<table>
<thead>
<tr>
<th>Per capita Pulse consumption</th>
<th>Real GDP</th>
<th>Pulses</th>
<th>Wheat</th>
<th>Rice</th>
<th>Milk</th>
<th>Edible oil</th>
<th>Eggs</th>
<th>Vegetables</th>
<th>Fruit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual growth rate, 1980-2000 %</td>
<td>-0.9</td>
<td>3.5</td>
<td>2.1</td>
<td>0.4</td>
<td>0.5</td>
<td>0.6</td>
<td>-1.0</td>
<td>-1.0</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Source: Price 2003

Although pulses contain about 20% protein, they are not substituted by other protein-rich foods such as fish and meat (Price *et al*., 2003), but by cereals, fruits, vegetables and milk products. This is particularly the result of lower prices for cereals compared to pulses. Ricebean is mainly used for *dal* cooking, and would be substituted by pulses which are also used to cook *dal* such as chickpea, lentils, green gram, black gram, cowpea and peas.

India’s agricultural sector has undergone drastic changes since the 1970s. Over the years, the main intention was to protect domestic agriculture from international competition (Agbola, 2004). In the 1970s and 1980s, policy targeted reducing hunger and meeting domestic demand with domestic production. Therefore the Indian government implemented tariffs, quotas and quantitative restrictions on imports, price controls, import licensing and marketing restrictions. In the 1990s, India started to reform its trade policy and began institutional reforms to foster economic growth. This included reduction in tariffs, quotas, import and export restrictions, abolition and/or lowering of industrial licensing and marketing restrictions, and floating exchange rates. This led to an opening of the Indian economy. Also in the early 1990s, the gap between domestic pulse production and consumption was widening and pulses were imported, so the reforms were also intended to deregulate the pulse sector and reduce this gap. Despite this, pulse imports to India still require agricultural permits and phytosanitary certification (Agbola & Damoense, 2005).

In 2003, the Commission for Agricultural Costs and Prices announced a minimum support price (MSP) for some pulses. The agency acquainted with the implementation of the MSP is the National Agricultural Cooperative Marketing Federation of India Ltd. (NAFED) (Sathe & Agarwal 2004). The MSP has no impact on domestic market prices of pulses because it is generally less than the market prices (Moe *et al*., 2008).
The traditional supply chain of farm produce is a result of the Agricultural Produce Marketing Committee (APMC) act implemented in the 1950’s and 60’s. This stipulated that the government set up market yards, mandis, in various cities (Kumar & Patwari, 2008). Retailers and processors had to buy agricultural commodities in mandis from commission agents or wholesalers, and buying directly from farmers was banned. Farmers also had to use mandis to sell their produce to traders, commission agents, and wholesalers. The act was amended in 2003 with two major changes: (i) retailers and processors were allowed to buy direct from farmers, thereby bypassing the mandis, and (ii) contract farming was permitted. Farmers however, may still sell in mandis. The impact of the amended AMPC act on the supply chain for farm produce is shown in Figure 3.3 (Business Standard, 2004).

In 2006, there were about 7,500 mandis in India. In addition, there are from 22,000 to 27,000 rural periodic agricultural markets, of which about 15% are regulated (Government of India, 2006a). The unregulated markets are known as haats, peta, angadi, hatwari, shandies, chindies or painths. These are sometimes periodic (weekly) and sometimes permanent (Debroy, 2005).

![Figure 3.3: Supply-chain of farm produce before and after the amended AMPC Act, 2003 (After Kumar, 2008)](image)

The mandis are usually near important production centres and towns. Although farmers are allowed to sell directly in markets since the 2003 AMPC Act amendment, they do not have good access to mandis (Debroy, 2005). However, wholesale markets are an important selling point for farmers in India regardless of whether they are regulated or unregulated. Nevertheless, farmers complain about poor market facilities, high fees to enter the markets, long distances, cheating traders, and limited access to market information (Fafchamps et al., 2008).

Figure 3.4 depicts a possible market channel for pulses in India. Govindan (2001) estimated that about 85% of the Indian pulses are sold through the channel shown. At the top level farmers must decide whether to sell their pulses in a market (e.g. mandi) or to a village trader. If farmers sell in mandis, more stages of agents and traders are involved between farmers and wholesalers compared to where they sell to village traders. However, both ways involve the stages of brokers and commission agents. These brokers and commission agents sell pulses to wholesalers, and wholesalers supply retailers.
There is no uniform objective grading in the Indian pulse sector. Some traders categorize pulses as “Fair to Average Quality” (FAQ) or “Special Quality” (SQ) but this is based on subjective visual inspection (Govindan, 2001). “Special quality” was defined by some foreign suppliers and domestic wholesalers, but the distinction between FAQ and SQ is informal and subjective. About 80% of traded pulses are classified as FAQ (Price et al., 2003).

The share of branded pulses traded in India is very small because there are no large companies or national level brands in the sector. Large companies were put off by governmental regulations such as regulation of stock limits and credit restrictions on pulse trade introduced by the Reserve Bank of India. Another negative fact for large companies is the small-scale of the pulse mills (Govindan, 2001). No large companies dominate the pulse sector. There are many wholesalers and other intermediaries, many small farmers that grow pulses, and many consumers who buy pulses. It could be said that the Indian pulse sector is a polypoly.

Price et al. (2003) and Govindan (2001) identify the following stages: farmers, commission agents and brokers, wholesalers, millers, retailers, and consumers. The first stage are the farmers who grow pulses. The majority of these are small-scale, with an average farm size of 1 ha or less. Since 1970, the number of marginal and small farmers has shown a constant increase (Government of India, 2004).

Marginal and small farmers produce small quantities of pulses that have to be aggregated in the next stage by wholesalers or commission agents. Commission agents, brokers and wholesalers typically take a margin of 1-1.5%, which does not include the costs of transportation, handling, storage, or processing (Govindan, 2001). Wholesalers trade up to 10 to 20 tonnes of pulses per day, and usually sell a minimum of one bag of 50 kg or 100 kg to retailers. Retailers may add value by cleaning and sorting. Generally, retailers sell pulses
loose to consumers, but sometimes they are packaged in bags of 0.5 kg to 1 kg. Indian retailers add a mark-up of 40% to 50% on wholesale prices (Govindan, 2001).

A further stage in the market channel of pulses is the mills, needed to decorticate and split pulses. Decorticated pulses have their hard hulls removed – they are then split and sold as dal. Some pulses, such as chickpea, black gram and green gram are also milled into flour. Most mills are small and use highly labour intensive, old technologies (Price et al., 2003). The milling industry is not relevant for ricebean, because it is usually sold as a whole grain.

The Indian pulse market may be summarized as follows. Domestic pulse production is insufficient to meet demand. The production of pulses is stagnating or declining, although the population is growing. Therefore pulses are imported. Chickpea, pigeon pea and lentil are the most important pulses grown. The surplus that is sold varies from pulse to pulse. Chickpea farmers sell most of their harvest (94%) and black gram farmers only sell 49% on average. Rural Indian consumers spend about 5% of their total food expenditure on pulses, and urban consumers 4%. From 1980 to 2000, pulse prices increased by 2%, leading to a reduction in consumption by 0.9%. The price elasticity of demand for pulses is large. Very poor rural consumers decrease their consumption by 0.8% if prices rise about 1%. The market channel for pulses involves six stages: farmers, commission agents and brokers, wholesalers, mills, retailer, and consumers.

3.1.2 Pulse market and marketing in Nepal

Nepal has an area of 147,181 km², of which about one fifth is used for agriculture. The total population was estimated as 28.6 million in 2008, with a growth rate of 2% per annum. Nepal is one of the least developed countries in the world with a per capita GDP of 236 US$, and is ranked 136 out of 177 countries in the Human Development Index. Agriculture is the major economic sector, contributing about 40% of the national gross domestic production. About 80% of Nepalese households depend on agriculture (Shrestha, 2005). Of the total agricultural land, about 10% is used for pulse production (Government of Nepal, 2004).

The majority of farmers in Nepal grow their crops on very small farms (Government of Nepal, 2004). Holdings from 0.2 – 1.0 ha account for more that 50% of the total, and most farm growing pulses are between 0.2 and 2.0 ha. As in India, pulses are usually grown in only one of kharif (May to October) or rabi (November to April). Most farmers rely on their own stocks as seeds for the following year, and only 1% of farmers exchange seeds with other farmers (WFP-EU, 2005).

The area utilized for pulse production varies over only a small range from about 310,000 to 320,000 ha, whereas pulse production increased from 211,000 t in 1997 to 269,000 t in 2007 (Government of Nepal, 2007). This was possibly because average yields increased from 0.6 t/ha to 0.8 t/ha. Lentil was by far the most important pulse grown in 2007 (Government of Nepal, 2008), followed by black gram followed by pigeon pea in 2007. The group ‘others’ includes ricebean, known as Masyng in Nepal (Government of Nepal, 2006). Until 2003, Nepal was a net exporter of pulses (FAOSTAT, 2010), but since 2004 imports have exceeded exports.

About a third of total food expenditure (34%) is spent on rice, and only about 3% on pulses. Nepalese spend about 20% of household food expenditure on non-vegetarian food, which includes eggs, fish and meat. This is higher than the expenditure share for non-vegetarian food in India, which is only about 6% (WFP, 2005).

The net availability of pulses in gram per capita per day shows no clear trend either upwards or downwards (FAOSTAT, 2010). Although the net availability of pulses has risen since 2001, it is still about 10 g lower than in India.
The change in retail prices of black gram, pigeon pea, green gram (broken) and lentils (broken) from 1993 to 2003 is shown in Figure 3.5. All prices have risen over the period. Lentil is the cheapest: the price for broken lentil shown includes processing costs for dehulling and splitting.

Figure 3.5: Changes in nominal annual average retail pulse prices in Nepal, 1995-2003 (Government of Nepal, 2003)

The income elasticity of pulses in Nepal is 0.3, so an increase of income of 1% would lead to an increase in the quantity demanded of 0.3% (Kumar, 2007). As in India, ricebean is mainly used for dal, and it is a clear substitute for those pulses also used for dal.

Acharya (2002) stated that the agricultural marketing system in Nepal consists of three levels. The first, the village level, consists of the farmers, who sell small quantities of agricultural products to merchants in towns. At the second level, these products are traded in periodical markets in towns. These markets, referred to as Hatiyas, take place once or twice a week and there were about 650 in Nepal in 2002. The last level includes wholesale markets in cities.

The stages of the pulse market channel in Nepal are shown in Figure 3.6. The product flow is depicted for unprocessed (whole grain) and for processed pulses (dal). As in India, pulse markets are polypolistic, with many buyers and sellers at each stage of the market channel.

In summary, Nepal produces about 270,000 tonnes of pulses per year for about 28.6 million people. Until 2003 it was a net-exporter of pulses, but since 2004 the quantity imported exceeds that exported. The most important pulses are lentil, chickpea and the group of ‘other’ pulses that includes ricebean. Nepalese consumers spend about 3% of their food expenditure on pulses, somewhat less than in India. Price elasticities of demand are not known for pulses in Nepal, but pulse consumption is positively related to household income.
3.2 Exploration of ricebean markets in India and Nepal

The previous section described and analysed the agricultural marketing systems of pulses in India and Nepal. In this section, the toolbox is applied to attain additional and more detailed information of the agricultural marketing systems.

3.2.1 Market data collection

Data were obtained from interviews with farmers and intermediaries from all market stages and by observing transaction practices on organized legumes markets. The interviews in Nepal and India were accomplished within two years. In 2008 interviews were conducted from January to March 2008. A further period of field work was carried out in India and Nepal from January to February 2009.

3.2.2 Selected pulse regions

We conducted the interviews in regions where ricebean is grown. The regions were selected through a report that documents the distribution of ricebean provided by the Nepalese and Indian researchers (Gautam et al., 2007). Figure 3.7 shows where we conducted surveys in India. The Indian state Uttarakhand (labelled ‘5’) was visited in 2008 and 2009. In Orissa (4), Chattisgarh (1 and 2), and Madhya Pradesh (3) interviews were carried out in 2008. The sampling route followed in Nepal is shown in Figure 3.8.
3.2.3 Surveys
In 2008, 95 interviews were conducted in the form of semi-structured interviews (Table 3.3). Key questions were asked to all agents interviewed, but additional responses and thoughts were also recorded. The interviews provided in-depth information about the trade in ricebean, and about the data which could be obtained from farmers or retailers. In 2009 a more standardized survey was developed based on the information from the previous year, and 35 farmers and 53 intermediaries were interviewed (Table 3.3). The responses for both years were combined wherever possible to avoid important information being left idle.
Table 3.3: Interviews from January – March 2008 & January – February 2009.

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2009</th>
<th>India</th>
<th>Nepal</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer</td>
<td>32</td>
<td>35</td>
<td>51</td>
<td>16</td>
<td>67</td>
</tr>
<tr>
<td>Intermediaries</td>
<td>63</td>
<td>53</td>
<td>67</td>
<td>49</td>
<td>116</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>95</strong></td>
<td><strong>88</strong></td>
<td><strong>118</strong></td>
<td><strong>65</strong></td>
<td><strong>183</strong></td>
</tr>
</tbody>
</table>

The method of scrutinizing the passage of ricebean from farmer to consumer in each region was as follows. First, we had to find an entry point, this could be a farmer or a trader but they had to sell or grow ricebean. Traders could be identified by checking their stock, but farmers could only be found by asking or by suggestions from third persons. Often it took a whole day to locate farmers who grew ricebean, because of references that could not be confirmed. Once an entry point into the local channel was found one could identify further agents and thus the full channel.

The description and analysis of the ricebean channel begins with a rough overview of the stages and their sequence. Then, characteristics and activities of farmers are described because they are in the beginning of the channel. The second part provides information about the intermediaries who represent all stages between farmers and consumers – for ricebean these are collectors, wholesalers, and retailers such as kirana-stores and supermarkets.

3.2.4 Market agents and configuration of the ricebean channel

Acharya (2004) distinguishes four channels for agricultural products from farmers to consumer in India: i) directly from farmers to consumers, ii) through public agencies or cooperative organizations, iii) through private wholesalers and retailers, and iv) through processors. In the current study, four different channels were identified through which farmers can sell ricebean to consumers in India and Nepal. These are shown in Figure 3.9.

![Figure 3.9: Ricebean channels in India and Nepal](image_url)

In general, farmers sell ricebean at marketplaces referred to as haats or mandis, whereas mandis are wholesale markets and haats are retail markets. If farmers are selling to wholesalers they can sell directly or via mandis. This channel is labelled with (1) in Figure 3.9. The unregulated retail markets referred to as haats are the second channel (2) for farmers to sell ricebean – farmers sell directly to consumers via these. The third channel (3) is the retail stage, including kirana-stores and supermarkets. Kirana-stores are permanent retail outlets like general stores. They can specialise in selling certain goods such as pulses, although most trade in almost everything from food to hygiene products to toys. In
Kathmandu the specialised grain *kirana* stores who sell by weight from large sacks are the most important retailers of ricebean, while the mixed traders sell their pulses bagged and never stock ricebean. This creates a bottleneck which should be addressed in a marketing strategy since the specialised grain stores are few, but the mixed stores are numerous. Supermarkets, which have rapidly emerged in developing countries in the last decade (Reardon *et al.*, 2003; Minten, 2008), also operate in the retail stage. In this study supermarkets were identified as a source of ricebean for consumers in Nepal but not in India. Supermarkets in Nepal may sell pure ricebean in plastic bags, but they are not available in every supermarket. Some supermarkets sell a mixture of nine pulses of which ricebean is an obligatory element, for the popular dish *quwanti*, a mixed bean sprout soup which is consumed particularly during the *Janai Purnima* festival. The fourth alternative for farmers is to sell ricebean through commission agents (collectors).

There are different cultivation methods for ricebean. It can be grown as a sole crop, or mixed with, for example, maize, cowpea or kidney bean. Farmers can grow it on plain crop plots, which is seldom done; or on slopes, terrace borders, field borders or bunds (small dykes that restrict water from moving from one field to another). Individual seeds can be sown in small holes, or it can be broadcast. Some varieties can reach a height of 2 m, while others only reach 0.5 m. The very tall varieties need something to climb up, such as stacks, or they hang on terraces and field borders. All these types of cultivation influence the yield.

Nearly every region in India has its own land units. Sometimes these have the same names but different areas, so there is no standard conversion factor. Therefore, we do not report yields in units per hectare, but we show yield per farmer, and the amount of seed sown. These vary considerably (Table 3.4), although the low mean and median yield per farmer indicates that most harvest small quantities.

**Table 3.4:** Ricebean yield per farmer and seeds sown (mean of India and Nepal).

<table>
<thead>
<tr>
<th>Ricebean</th>
<th>n</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>CV%</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield in kg</td>
<td>67</td>
<td>0.5</td>
<td>350</td>
<td>44.1</td>
<td>149</td>
<td>20</td>
</tr>
<tr>
<td>Seeds in kg</td>
<td>66</td>
<td>0.1</td>
<td>25</td>
<td>2.3</td>
<td>170</td>
<td>2</td>
</tr>
<tr>
<td>Ratio yield:seeds</td>
<td>66</td>
<td>0.1</td>
<td>200</td>
<td>29.6</td>
<td>131</td>
<td>16</td>
</tr>
</tbody>
</table>

All farmers kept seeds from the previous year rather than buying it, so a seed exchange between farmers or with seed companies may not exist for ricebean.

Farmers were also asked about their post-harvest practices. All stated that they dried and cleaned ricebean, and about one third also sort them. About 70% store ricebean, and one third protect it against storage pests. Many farmers use home remedies like ash for this purpose.

More than half (57%) of the farmers in India and Nepal who grow ricebean do not sell it (Table 3.5). However, there are huge differences between Nepal and India with 88% and 29% respectively. If farmers do not sell ricebean they keep it for their own consumption. None of the farmers sold all of the ricebean they produced, because the maximum proportion of total yield sold, the marketed surplus, is 95%, with farmers keeping at least 5% for home consumption. The mean value of the yield kept for home consumption is about 70%, so most ricebean is used for this purpose.

**Table 3.5:** Proportion of respondent farmers who sell ricebean.

<table>
<thead>
<tr>
<th>Sell ricebean</th>
<th>India</th>
<th>Nepal</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Yes</td>
<td>15</td>
<td>29</td>
<td>14</td>
</tr>
<tr>
<td>No</td>
<td>36</td>
<td>71</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>51</strong></td>
<td><strong>16</strong></td>
<td><strong>67</strong></td>
</tr>
</tbody>
</table>
The distance that farmers have to travel to sell ricebean varies considerably (Table 3.6). Some can sell to their neighbours, or have a local marketplace in their village. Others had to go 80 km to the nearest market.

Table 3.6: Marketed surplus and sold quantities of ricebean

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketed surplus in % of production</td>
<td>68</td>
<td>95</td>
<td>27</td>
</tr>
<tr>
<td>Quantity of ricebean sold in kg</td>
<td>0</td>
<td>290</td>
<td>25</td>
</tr>
<tr>
<td>Distance to market in km</td>
<td>0</td>
<td>80</td>
<td>15</td>
</tr>
</tbody>
</table>

Figure 3.10 shows to whom the surveyed farmers sold ricebean. The most frequent buyers were *kiranas*. Usually, farmers go directly to these to sell ricebean and other crops, probably because these shops offer a wide range of products from food stuff to toiletries, and when farmers have sold their crops they can buy things they need. Some farmers also sold to neighbouring households. None of the interviewed farmers sold to wholesalers, but that does not mean that wholesalers do not buy from farmers. Sometimes interviewed wholesalers could not recall where their ricebean supplying farmers came from. One of the Nepalese farmers was selling ricebean to a cooperative, in which several farmers rent a big truck to transport and sell ricebean and other crops in larger cities, such as Kathmandu.

To compare the prices (Table 3.7) that farmers received it was necessary to convert Nepalese Rupees (NPR) into Indian Rupees (INR). The difference in mean prices received by farmers in India and Nepal are small (1.70 INR/kg), although the range between the lowest and the highest price a farmer received is large. In India, the highest price was more than 300% higher than the lowest price, while the range in Nepal was about 200%.

Table 3.7: Farmers’ selling prices (INR/kg, n = 14)

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>11.00</td>
<td>35.00</td>
<td>20.76</td>
</tr>
<tr>
<td>Nepal</td>
<td>13.13</td>
<td>29.69</td>
<td>19.06</td>
</tr>
</tbody>
</table>

A possible explanation for the large range in farm-gate prices is that farmers are selling their ricebean to all following stages, such as wholesalers, collectors, and *kiranas*. Figure 3.11 shows that *kiranas* paying the highest prices to farmers, collectors pay lower prices. The
responses of farmers and intermediaries about the prices that farmers received were almost the same.

In the structured interviews in 2009, farmers were also asked which sources they used to acquire information about pulses, and which media are used for that purpose. The results are shown in Table 3.8. The most important information source was friends and relatives, from whom 85% get their information. Other farmers are the second most frequently used source, followed by *kiranas*. Few used media sources.

**Table 3.8:** Sources and media of information about pulses prices (n = 20).

<table>
<thead>
<tr>
<th>Information sources for farmers</th>
<th>%</th>
<th>Media</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friends &amp; relatives</td>
<td>85</td>
<td>Telephone</td>
<td>10</td>
</tr>
<tr>
<td>Farmers</td>
<td>75</td>
<td>Internet</td>
<td>0</td>
</tr>
<tr>
<td><em>Kiranas</em></td>
<td>50</td>
<td>TV, radio</td>
<td>0</td>
</tr>
<tr>
<td>Collectors</td>
<td>20</td>
<td>Newspaper</td>
<td>0</td>
</tr>
<tr>
<td>Wholesalers</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processors</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumers</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ministry of agriculture</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research institutes</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These results are backed-up by other studies from India. Fafchamps *et al.*, (2008) reported that farmers’ sources of information about prices, postharvest activities and quality management are mostly other farmers. District agricultural officers should spread information to enhance production and marketing, but farmers do not trust them. Table 3.8 also shows that farmers only use telephones as a medium to exchange information about pulses. The use of internet, TV, radio and newspaper is limited by their widespread absence in remote areas and by poverty.

Intermediaries are agents who at certain stages are involved in handling and trading a product on the way from farmer to consumer. In this study 4 were identified: collectors, wholesalers, and supermarkets and *kiranas* at the retail stage. As ricebean is not processed there were no mills or other processing firms involved.

Table 3.9 shows the number of intermediaries interviewed in Nepal and India. Supermarkets that sold ricebean were only found in Nepal. Supermarkets in Nepal, as everywhere in the
world, employ fixed posted prices. Many use cash registers with barcode scanners, and sell most of their products, including ricebean, packaged. The physical and institutional infrastructure of supermarkets is well developed. They have cold storage facilities, running water, and use uniform weights.

<table>
<thead>
<tr>
<th>Country</th>
<th>Supermarkets</th>
<th>Kiranas</th>
<th>Wholesalers</th>
<th>Collectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nepal</td>
<td>3</td>
<td>32</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>India</td>
<td>0</td>
<td>56</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>88</td>
<td>17</td>
<td>7</td>
</tr>
</tbody>
</table>

*Kiranas*, in India and Nepal, do not usually post their prices, over which consumers bargain. Unprocessed food, such as ricebean, wheat or flour, is sold loose. Cash registers are mostly absent. The infrastructure of *kiranas* comprises stalls and racks to display commodities, whereas pulses and other grains are sold loose from sacks. Standard weights are uncommon.

In marketplaces such as *mandis* and *haats*, farmers sell to wholesalers, collectors or directly to consumers. Bargaining is the common price finding mechanism, and products are sold loose. Some marketplaces have physical infrastructure such as stalls, but in many the commodities are sold on the ground. Cold storage, running water, and grading machines are rarely available. Uniform weights are regularly lacking, and volume units such as cups or tins are used; sometimes stones are used for weighing. The number of buyers and sellers on a marketplace varies across locations. Rural markets are attended by fewer buyers and sellers than those in urban areas.

The sales volumes for each stage are presented in Figure 3.12. Supermarkets sell on average 164 kg ricebean per month, whereas *kiranas* sell about 80kg. Wholesalers sell the largest quantities.

![Box plot of monthly sales quantities (kg) for various stages](image)

*Extrem values □ Outlier

**Figure 3.12:** Monthly sales quantities (kg) for various stages

Figure 3.13 shows the difference between mean buying and selling prices of ricebean, and the estimated margins. In comparison to India, intermediaries in Nepal pay higher prices to farmers, and sell ricebean for higher prices to their customers. The mean margin in India is 19% of the buying price, and in Nepal 15%.
As every stage has its marketing costs, ricebean is marked-up several times between farmers and consumers. Farmers sell for about 20.00 INR/kg (Table 3.7) in both countries. The stages in Figure 3.14 are arranged according to the mean buying and selling prices. The following ranking emerges: collectors, wholesalers, supermarkets and *kiranas*. Collectors buy and sell for the lowest prices, but have the highest margin (25% of the buying price, 4.25 INR/kg). Wholesalers offer and buy for the second lowest price, and generate a margin of 11%. *Kiranas* have the highest mean buying and selling prices and a margin of 17%, while supermarkets offer cheaper ricebean than *kiranas* but have the lowest margins (10%, 2.50 INR).

We now build on Figure 3.9 to provide a detailed analysis of ricebean flow in India and Nepal. We asked intermediaries at which stage they purchased ricebean, and to which stage they sold it. To depict the product flow it is necessary to document the sales and purchases at every stage. Table 3.10 shows the stage at which supermarkets, *kiranas*, wholesalers, and collectors procure ricebean. Most intermediaries have several sources for ricebean, so there
are more responses than interviewed agents per stage. The first column contains the sources (sellers) of ricebean, and the remaining four show how many respondents at each stage procure ricebean from the listed source (farmers, wholesalers, collectors and kiranas).

**Table 3.10: Sources of ricebean at each stage in the supply chain in Nepal and India.**

<table>
<thead>
<tr>
<th>Source</th>
<th>Supermarkets (n=3)</th>
<th>Kiranas (n=87)</th>
<th>Wholesalers (n=17)</th>
<th>Collectors (n=7)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Responses</td>
<td>Responses</td>
<td>Responses</td>
<td>Responses</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Farmers</td>
<td>0</td>
<td>0</td>
<td>52</td>
<td>50</td>
</tr>
<tr>
<td>Wholesalers</td>
<td>2</td>
<td>67</td>
<td>34</td>
<td>33</td>
</tr>
<tr>
<td>Collectors</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Kiranas</td>
<td>1</td>
<td>33</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>100</td>
<td>24</td>
<td>7</td>
</tr>
</tbody>
</table>

Two of the three surveyed supermarkets bought ricebean from wholesalers, but one also procured it from a kirana, the most expensive source (Figure 3.14). Possibly supermarkets revert to kiranas if wholesalers are not able to provide ricebean. Several important festivals in Nepal are strongly connected with ricebean consumption. Ricebean is also consumed at wedding parties in Nepal, and the wedding season is at the beginning of the year (February – March), so supermarkets have to offer ricebean at that time (Andersen, 2007).

Half of the interviewed kiranas bought most of their ricebean directly from farmers, which corresponds to the results from the farmer interviews (Figure 3.10). Because kiranas offer a great range of products, farmers can spend their income from ricebean sales on everyday commodities that are not available in villages or from wholesalers. Farmers also receive the highest prices for their ricebean from kiranas (Figure 3.11).

Wholesalers have a wide range of sources for ricebean. They buy directly from farmers or from collectors, and even from other wholesalers, although their main source are collectors.

As expected, collectors major source are farmers. The work of a collector can be described as follows: first the collector receives an order from his client, than he and the client agree on quantities and prices, afterwards the collector goes to villages to purchase the required quantities. Because collectors have often already fixed the selling price, they will try to increase their margin by driving down the price the pay to growers.

Table 3.11 shows the purchasers of ricebean, from interviews with intermediaries. The customers of supermarkets and kiranas are mainly households, referred to as end consumers. Only one surveyed kirana delivered ricebean to a collector: three sold to wholesalers, and eight sold to other kiranas. Wholesalers mainly served kiranas, but also sell direct to consumers. Collectors’ clients are kiranas, households and wholesalers.

**Table 3.11: Purchasers of ricebean for each stage in Nepal and India.**

<table>
<thead>
<tr>
<th>Purchaser</th>
<th>Supermarkets (n=3)</th>
<th>Kiranas (n=87)</th>
<th>Wholesalers (n=17)</th>
<th>Collectors (n=7)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Responses</td>
<td>Responses</td>
<td>Responses</td>
<td>Responses</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Households</td>
<td>3</td>
<td>100</td>
<td>72</td>
<td>86</td>
</tr>
<tr>
<td>Farmers</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Wholesalers</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Collectors</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Kiranas</td>
<td>0</td>
<td>0</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td>84</td>
<td>26</td>
<td>9</td>
</tr>
</tbody>
</table>
Intermediaries were also asked about the sources of information they used when they needed information about pulses, e.g. prices, quality or new varieties. Collectors were not included as they did not answer that question. The three supermarkets, indicated through the black bars (Figure 3.15), used many information sources but relied mainly on wholesalers and research institutes. The main source of information for *kiranas* was wholesalers, followed by other *kiranas*. Wholesalers got their information from *kiranas*, collectors and other wholesalers. The most important source for information for all seems to be wholesalers.

Figure 3.16 shows the media used by intermediaries to get pulse information. Telephones are important for supermarkets, *kiranas* and wholesalers. Newspapers are used by *kiranas* and wholesalers, but again internet, TV and radio are rarely used.
3.2.5 Major findings of ricebean marketing in India and Nepal

The yield per farmer, ratio of yield:seeds, and cultivation methods used by farmers vary widely. Yields per farmers range from 0.5 to 350 kg. On average, they harvest 44 kg in a season, and most harvest only small quantities of ricebean (Figure 3.17).

The main post-harvest activities are drying, cleaning and storing. All interviewed farmers dried and cleaned ricebean, and 70% stored it. About 43% of the interviewed farmers sold ricebean, although none sold all of it, always keeping a portion for home consumption. The average marketed surplus was about 30% of the production. If farmers sold ricebean, most sold to kiranas, because they pay the highest prices (Figure 3.11). The difference in the mean prices that farmers receive in India and Nepal is small (1.70 INR/kg), but the range between the lowest and the highest price farmers receive is large. Friends, relatives and other farmers...
are the most important information sources for farmers when they need information about pulses.

The interviews with intermediaries revealed 4 stages within the ricebean channel: collectors, wholesalers, kiranas and supermarkets. Ricebean is never graded, and is often sold in non-standardized weight or volume units. In Nepal, buying and selling prices were higher but the margin of 15% is lower than the margin of 19% in India. Prices increased from collectors to wholesalers to supermarkets, and were highest in kiranas. The main sources of ricebean for all stages are farmers. The analyses of ricebean flow between stages showed that there is no standard or structured pathway from farmers to consumers. Wholesalers are the most important source of information for all stages and phones are the main information medium.

4 Discussion and implications

The toolbox was found to be a comprehensive instrument to describe the agricultural marketing system for pulses and ricebean, because the multitude of characteristics from the four perspectives allowed a detailed insight. However, most of the characteristics that were derived from the supply chain view could not be applied. Other authors (World Bank, 2008; Woods, 2004) concluded from describing the configuration and mechanism of agricultural marketing systems in developing countries that they were far from the supply chain management approach. However, Woods (2004) stated that supply chain management was needed in developing countries as an approach able to deal with recent developments such as greater product variety, improvements in product quality, cost-effective transport and increasing consumer sensitivity to quality. Further, developing countries would benefit of the adoption of quality standards to compete with other exporting countries, and these could be facilitated by coordinating and managing supply chains, the base of SCM.

Coordination, an innate characteristic of supply chain management, does not exist between market agents in the pulse sector in India and Nepal. The relations between agents or stages of the sector are anonymous (transaction based only), and it seems that a supply chain oriented marketing strategy for a new ricebean variety could be excluded.

The purpose of the previous sections was to analyse and describe the agricultural marketing systems in India and Nepal in order to derive a marketing strategy to introduce an improved ricebean variety into the market. This information will now be used, in combination with the concept of the marketing mix, to derive implications that should be considered when an improved ricebean variety is introduced. The marketing mix implies the combined application of the four marketing instruments: i) price, ii) distribution (place), iii) product, and iv) communication (promotion) (Crawford, 1997, Shepherd & Futrell, 1982).

Price

Currently, ricebean production is concentrated in rural areas with poor market access. The consequence was shown by the model of subsistence households, which disclosed that the price that farmers receive for their products is positively correlated to the quantity they sell in markets. If farmers have to overcome long distances to sell ricebean, the price decreases as transport costs increase. This could be one reason for the small ricebean trade.

The reaction of consumers to price changes could be estimated by the price elasticity of demand. There is no elasticity for ricebean, just for pulses in general. Kumar (1998) and Mittal (2006) estimated a price elasticity of demand of -0.8 for pulses. This is comparable to that for milk, oil, or sugar. The quantity of these products demanded would decrease by 0.8% if the price increased by 1%. The price elasticity is also influenced by the availability of substitutes, the number of uses of a commodity, the proportion of income that is spend on the product, and the degree of commodity aggregation (Colman & Young, 1989).
There are many close substitutes for ricebean available in Indian and Nepalese markets. For example, cowpeas, black gram or green gram. Thus, if prices of ricebean change it can be easily substituted by other pulses, and vice-versa.

The number of uses of a commodity increases its price elasticity. Pulses are mainly used as food or feed. The increase of the own price elasticity due to multiple uses does not seem to be relevant for pulses in general or ricebean in particular, which is only used as a whole grain for food and the plant as a livestock feed.

Indian and Nepalese consumers spend about 4% of their total food expenditure on pulses. The proportion of total expenditure as food in India was about 50% in 2004, and in Nepal (2003) it was 59% (FAO, 2009). Consumers in both countries spend only about 3% of their total expenditures on pulses, which decreases the elasticity.

The elasticity of widely aggregated commodities such as foods will be reduced because substitutes are reduced and the proportion of income spent on that aggregated commodity increases.

**Distribution**

The first step in the introduction of a new variety starts with the distribution of improved seeds to farmers. These have to be distributed widely in different regions, because ricebean growing farmers do not usually buy seeds from seed companies or traders, but keep their seeds from the previous year. Generally, all stages of the ricebean channel could be used to distribute seeds because farmers have exchange relation at all of them, although the majority sell to *kiranas*.

Ricebean growing farmers produce small quantities that vary from year to year due to the weather, pests and diseases. Thus, farmers and intermediaries may not be able to forecast how much ricebean is produced and how much can be sold. This uncertainty may be why ricebean is not permanently offered for sale, in contrast to, for example, pigeon pea or chickpea.

Most farmers sell to *kiranas*, and most of the interviewed *kiranas* purchase ricebean from farmers. This decentralized exchange has higher transport costs than a centralized exchange (2.1.2), but these could be reduced if the small quantities of ricebean could be aggregated in markets or through middleman such as collectors.

Storing is a means to adapt a seasonal harvest to permanent demand. Availability over the whole year could be achieved by aggregating and storing small quantities in collection centres to assure a regular supply. Storing ricebean over a longer period seems to be feasible, because the majority of farmers stated that they do not have pest problems (insects, fungus) while storing ricebean.

**Product**

The management of a product comprises several options such as branding, packaging or product mix. The branding of ricebean may require packaging. If ricebean is sold in packages of e.g. 1 kg it would be easier to introduce a brand and provide additional information. The information could include origin and nutritional facts as well as recipes. Recipes could provide a wider range of dishes that include ricebean and thereby enlarge the quantity demanded, and a number have already been developed by this project (Andersen *et al.*, 2009).

The second option is the product mix –the assortment of types of products and product lines. Currently, ricebean is mainly sold as whole grain without further processing, in addition to the above mentioned *quantee* bean mixture in Nepal. The main dish prepared from ricebean is *dal*, a gravy soup. Uses of ricebean could be extended by offering ricebean flour. Flour
would then be an option to create a product mix of ricebean, and again work to test this has begun (Andersen et al., 2009).

Assumed that breeders succeed in developing an improved variety, consumers’ preferences are considered through the hedonic price analysis (Buergelt et al., 2010a), that revealed the relevant quality characteristics. However, ricebean has other traits that could be adapted to consumer preferences, such as its phenotypic heterogeneity such as colour and seed size. Due to this variation, ricebean does not seem to be perceived as a “product” by consumers because it has several names, based upon its appearance, in the local languages. A uniform appearance could be achieved by grading for size and colour. Grading would have two purposes. The first is to homogenise commodities and make them comparable without inspection. Grades allow a uniform and accurate description of a product, so that a potential buyer can decide if he wants to purchase the graded product at a given price without inspecting it (Shepherd & Futrell, 1982). Secondly, grades are used to penetrate markets by offering a unique quality or safety aspect. The later usage is observed in societies with high income classes (Reardon et al., 2001). Grades increase marketing efficiency because efforts and time for bargaining and transport are reduced (Shepherd & Futrell, 1982). The influence of grades on transaction costs was discussed in detail in section 1.1.2. Further, consumers can signal preferences by using the information given through grades. Price differences between grades direct farmers to adapt their production to consumers’ needs (Kohls & Uhl, 1985).

If grades are implemented the following criteria should be considered. They should be user (consumer) oriented and easy to recognize. The determination and interpretation of characteristics as basis for grades has to be accurate and uniform. Characteristics and terminology of grades should be usable over the whole marketing channel, from farmers to consumers, and consumer orientation grades should consider product quality. For this, each grade should include enough of the average production to be a meaningful class. Finally, the costs of implementing and operating grades should be reasonable (Kohls & Uhl, 1985).

Communication
Marketing communication has five objectives: providing information, stimulating demand, differentiating the product, highlighting the product’s value, and regulating sales. Possibly the most important information for consumers about ricebean is the price. Usually, ricebean is sold loose in sacks and prices are not posted. It would be feasible to create small signs that intermediaries put into the sacks to catch the attention of consumers and post prices. Awareness could also be enhanced by tasting sessions in stores, on markets or festivals, as has already been done successfully by LI-BIRD in Nepal and by CSKHPKV in Himachal Pradesh, India (e.g. Anderson et al., 2009; Hollington et al., 2009). A means to stimulate demand could be the recipes already mentioned, or nutritional facts on ricebean packages. Urban consumers who most likely do not know ricebean would be given ideas for possible dishes. In general, information about the improved variety should be provided to the local press, radio stations and television to stimulate demand, and leaflets could be provided to consumers and intermediaries.

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Government of Nepal, 2007


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