AGRICULTURAL SITUATION IN INDIA

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Agricultural Situation in India

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Abbreviations used

N.A. —Not Available.
N.Q. —Not Quoted.
N.T. —No Transactions.
N.S. —No Supply/No Stock.
R. —Revised.
M.C. —Market Closed.
N.R. —Not Reported.
Neg. —Negligible.
Kg. —Kilogram.
Q. —Quintal.
(P) —Provisional.
Plus (+) indicates surplus or increase.
Minus (–) indicates deficit or decrease.

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GENERAL SURVEY

Agriculture

Rainfall

With respect to rainfall situation in India, the year is categorized into four seasons: winter season (January-February); pre monsoon (March-May); south west monsoon (June- September) and post monsoon (October-December). South west monsoon accounts for more than 75 per cent of annual rainfall. The actual rainfall received during the period 01.03.2014 - 14.05.2014, has been 96.9 mm as against the normal at 94.4 mm. Rainfall has been in excess (+20% or more) in 18 sub divisions as compared to 4 during the corresponding period last year. As per the India Meteorological Department (IMD) Long Range Forecast report released on 24.04.2014, warming trend in the sea surface temperatures over the equatorial Pacific can reach up to El Nino level during the southwest monsoon season with a probability of around 60 per cent.

All India production of foodgrains

As per the 3rd advance estimates released by Ministry of Agriculture on 15.05.2014, production of total foodgrains during 2013-14 is estimated at 264.38 million tonnes compared to 257.13 million tonnes in 2012-13.

TABLE 1 Production of Major Agricultural Crops (in Million Tonnes)

Crop	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14 (3rd advance estimates)
Rice	99.18	89.09	95.98	105.30	105.24	106.29
Wheat	80.68	80.80	86.87	94.88	93.51	95.85
Total Pulses	14.57	14.66	18.24	17.09	18.34	19.57
Total Food grains	234.47	218.11	244.49	259.29	257.13	264.38
Total Oilseeds	27.72	24.88	32.48	29.79	30.94	32.41
Sugarcane	285.03	292.30	342.38	361.04	341.20	348.38

Procurement

Procurement of rice as on 16.05.2014 was 27.36 million tonnes during 2013-14 and procurement of wheat as on 16.05.2014 was 25.19 million tonnes during 2014-15.

TABLE 2 Procurement in Million Tonnes

	2010-11	2011-12	2012-13	2013-14	2014-15
Rice	34.20	35.04	34.04	27.36*	-
Wheat	22.51	28.34	38.15	25.09	25.19*
Total	56.71	63.38	72.19	51.46	-

* Position as on 16.05.2014

Off-take

Off-take of rice during the month of March, 2014 was 26.991akh tonnes. This comprises 21.32 lakh tonnes under TPDS and 5.67 lakh tonnes under other schemes. In respect of wheat, the total off take was 33.84 lakh tonnes comprising of 17.18 lakh tonnes under TPDS and 16.66 lakh tonnes under other schemes.

Stocks

Stocks of food-grains (rice and wheat) held by FCI as on May 1, 2014 were 63.06 million tonnes (lower by 18.6 per cent compared to the level of 77.46 million tonnes as on May 1, 2013).

TABLE 3 Off-Take and Stocks of Food Grains (Million Tonnes)

Crop	Off-take			Stocks	
	2011-12	2012-13	2013·14 (Up to Mar 1, 2014)	May 1, 2013	May 1, 2014#
Rice	32.12	32.64	24.21	34.73	20.42
Unmilled Paddy in terms of Rice					8.24
Wheat	24.26	33.21	23.79	42.73	34.40
Total	56.38	65.85	48.00	77.46	63.06

Note: Buffer Norms for Rice and Wheat are 14.20 Million Tonnes and 7.00 Million Tonnes respectively as on 1.4.2014.

Since September, 2013, FCI gives separate figures for rice and unmilled paddy lying with FCI & state agencies in terms of rice.

Growth of Economy

As per the Advance Estimates of the Central Statistics Office (CSO), the growth in Gross Domestic Product (GDP) at factor cost at constant (2004-05 prices) is estimated at 4.9 per cent in 2013-14 with agriculture, industry and services registering growth rates of 4.6 per cent, 0.7 per cent and 6.9 per cent respectively. The GDP growth rate is placed at 4.4 per cent, 4.8 per cent and 4.7 per cent respectively in the first, second and third quarters of 2013-14.

TABLE 4 Growth of GDP At Factor Cost By Economic Activity (at 2004-05 prices)

Sector	Growth			Percentage Share in GDP		
	2011-12	2012-13(1R)	2013-14(AE)	2011-12	2012-13(1R)	2013-14(AE)
1Agriculture, forestry & fishing	**5.0**	**1.4**	**4.6**	**14.6**	**14.4**	**13.9**
2 Industry	**7.8**	**1.0**	**0.7**	**27.9**	**28.2**	**27.3**
a Mining & quarrying	0.1	-2.2	-1.9	2.2	2.1	2.0
b Manufacturing	7.4	1.1	-0.2	16.2	16.3	15.8
c Electricity, gas & water supply	8.4	2.3	6.0	1.9	1.9	1.9
d Construction	10.8	1.1	1.7	7.6	7.9	7.7
3 Services	**6.6**	**7.0**	**6.9**	**57.5**	**57.4**	**58.8**
a Trade, hotels, transport & Communication	4.3	5.1	3.5	27.3	26.7	26.9
b Financing, insurance, real estate & business services	11.3	10.9	11.2	17.3	18.0	19.1
c Community, social & personal services	4.9	5.3	7.4	12.9	12.7	12.8
4 GDP at factor cost	**6.7**	**4.5**	**4.9**	**100**	**100**	**100**

1 R: 1st Revised Estimates; AE: Advance Estimates. Source: CSO.

TABLE 5 Quarterly Growth Estimate of GDP (Year-on-year in per cent)

	2011-12				2012-13				2013-14		
Sector	**Ql**	**Q2**	**Q3**	**Q4**	**Ql**	**Q2**	**Q3**	**Q4**	**Ql**	**Q2**	**Q3**
1Agrlculture, forestry & fishing	**6.5**	**4.0**	**5.9**	**3.4**	**1.8**	**1.8**	**0.8**	**1.6**	**2.7**	**4.6**	**3.6**
2 Industry	**10.1**	**8.2**	**6.9**	**6.3**	**0.3**	**-0.4**	**1.7**	**2.1**	**0.2**	**2.3**	**-0.7**
a Mining & quarrying	0.3	-4.6	-1.9	5.8	-1.1	-0.1	-2.0	-4.8	-2.8	-0.4	-1.6
b Manufacturing	12.4	7.8	5.3	4.7	-1.1	0.0	2.5	3.0	-1.2	1.0	-1.9
c Electricity, gas & water supply	8.5	10.3	9.6	5.4	4.2	1.3	2.6	0.9	3.7	7.7	5.0
d Construction	8.9	11.9	12.2	10.2	2.8	-1.9	1.0	2.4	2.8	4.3	0.6
3 Services	**6.7**	**7.0**	**6.5**	**6.1**	**7.2**	**7.6**	**6.9**	**6.3**	**6.7**	**6.0**	**7.6**
aTrade, hotels, transport & communication	5.5	4.7	4.0	3.3	4.0	5.6	5.9	4.8	3.9	4.0	4.3
b Financing, insurance, real estate & business services	11.3	12.0	11.1	11.0	11.7	10.6	10.2	11.2	8.9	10.0	12.5
c Community, social & personal services	2.4	5.4	5.7	5.7	7.6	7.4	4.0	2.8	9.4	4.2	7.0
4 GDP at factor cost	**7.6**	**7.0**	**6.5**	**5.8**	**4.5**	**4.6**	**4.4**	**4.4**	**4.4**	**4.8**	**4.7**

Source: CSO.

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ARTICLES

Farm Profit and Productivity- Analytical Study

DR. T. C. CHANDRASHEKAR*

Farm Profit change over time is first decomposed into a price effect and a quantity effect; the quantity effect is then decomposed into a productivity effect and an activity effect; in turn, the productivity effect is subdivided into a technical efficiency effect and a technical change effect, while the activity effect is divided into a scale effect, resource mix effect and product mix effect. The end result is therefore a measure of six distinct components of profit change. The methodology is used to investigate profit changes for a sample of cereal farms drawn from the Farm Business Survey in India for the period 2007 to 2013. The results of the analysis show an overall decline in profit levels for the period at the average speed of £4400 annually, with the major part of this decline attributable to a negative price effect amounting to £7000 annually on average. However, this was to some degree offset by a positive quantity effect largely driven by the positive contribution of technical change to profit growth, worth £4000 annually on average. The pattern of development and trends in productivity and profitability have been analysed to find whether Indian agriculture meets the requirements of sustainable development. The study is based on the secondary data culled from the publications of the Department of Agriculture and Department of Statistics, Govt. of India. A tremendous development and spectacular growth have been observed in agriculture during the past five decades, 1949-50 to 1999-2000. However, there has not been any spectacular modification in the technology since 1980s, leading to a continuous deceleration in the rates of growth of both production and productivity of most crops in recent years. Because of decline in yield, the economic condition of farmers has deteriorated. On the other side, non-agricultural sector has shown a growth of 6 per cent. This increasing disparity between per capita income of agricultural and non-agricultural sectors is likely to raise social disorder in the farming class. Our study used cost-benefit and econometric analysis to draw difference between productivity and profit corn ponents in the agriculture sector

1.1 Introduction

Farmers and research administrators are concerned with both profit and productivity. These are two related but distinct concepts. Profit is a measure of receipts less costs. Economists split costs into two broad categories, those that vary with output (variable costs) and those that do not (fixed costs). Different profit measures use different definitions of 'receipts' or 'costs'. For example, some profit measures - like farm gross margin - take account of variable costs, but exclude fixed costs. Profit will change when something affects either receipts or costs. For example, an output price change will alter profit because it affects receipts (price of output times the quantity of output). If costs stay constant, and output price rises, then by definition, profits will rise. Productivity is a measure of the units of (physical) output that can be produced from a given amount of (physical) inputs. We can most easily measure productivity when a production process requires only one input, and one output. For example, if a farm produces milk. and only uses labour, then productivity is measured by the amount of milk per labour unit (for some defined time period. Productivity will not be affected by a change in output price, because price is not part of the productivity equation; a change in output price does not affect the ability of the farm to transform inputs into outputs. Anything that alters the ability of a farm to transform inputs into outputs (for example, something that lets us get more milk per labour unit) will improve productivity.

This is usually the focus of research: to alter production processes so that productivity improves. Generally, prices (of inputs or outputs) will affect profit, but they will not affect productivity. However, technical change (via research or other means) will affect both productivity and profit since it affects the ability of farms to convert inputs to outputs (productivity) and hence affects receipts (output price times output quantity) or costs (input price times input quantity) or both. Farmers are concerned with profit because it provides the means for current consumption (food, clothing, education, etc.) and investment (which provides future consumption). They are concerned with productivity to the extent that it helps them create higher profits, or to counter the inexorable cost-price squeeze. Research administrators know that for an industry to survive, it has to continually improve its productivity. Otherwise, international competition will displace domestic production on the world market, and at home. This could lead to the demise of an industry. But prospering is not easy. Generally, farmers are involved in a game of survival: farms are constantly on a 'treadmill', where they must improve performance to survive, but just as they reach their short-term performance target, the goalposts shift. National and international forces constantly move the goalposts: international farms improve their performance and push prices down; new technologies

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revolutionise the way commodities are bought and sold, the speed of their delivery, and the safety of their handling, etc. So how do farms and industries remain profitable? Farms do this both individually, and as part of an industry.

1.2. Farm Profitability

1.2.1 Profitability

Profit measures the financial performance of farms. It is a measure of receipts less costs. Different profit measures include different definitions for 'receipts' and 'costs'. Economists generally split costs into fixed and variable. Fixed costs are those that do not vary with output produced (for example, an annual lease payment on a tractor does not vary with the quantity of crop harvested). Variable costs do, as their name suggests, vary with output (a larger area of crops will generally require more fertilizer, all else constant).

The accountant's method of calculating costs differs from the economist's. For example, an accountant may not consider family labour as a cost because it does not involve a cash outflow. However, the economist considers family labour a resource that could have been used elsewhere, if it were not used on the farm; the labour has an opportunity cost. This opportunity cost is included in the economist's calculation of profit. For a given definition of receipts and costs, there are two ways of measuring profitability: in an absolute or a relative sense. We now look at each of these in turn.

1.2.2 Absolute Profitability

Measures of absolute profitability are based on the level of profit. Absolute profitability can be measured on a farm basis or on a per unit of output or input basis.

Absolute farm profit is a measure of 'whole of farm' performance, and it may be calculated as total farm receipts less total (fixed plus variable) costs; or total farm receipts less variable costs (which we call variable profit, or farm gross margin).Absolute farm profit may obscure how a farm was able to generate profits. For example, a farm may undertake several agricultural activities, where one generates a loss, but another earns a profit. A farm level profit measure may not contain any information on the profitability performance of the farm's different activities. Therefore, farm-level profit may provide a partial evaluation of the profitability of the farm.

Farm profit can usually be disaggregated into different farming activities. For example, in a mixed sheep-cropping farm, we may be able to determine how much profit the farm derives from crops, and how much it derives from sheep. However, this is only true to the extent we know how to attribute the farm's costs between crops and sheep. This allocation of costs is complicated by interactions between outputs.

For example, cropping activities may depend on rotating land use between different cropping activities and livestock activity in order to maintain a nutrient balance in the soil. Therefore, the allocation of costs is not clear-cut in practice. Nevertheless, disaggregated farm profit may still be a useful management tool in identifying potential profitability problems.

Absolute profitability measured on a per unit or per output basis - such as gross margin per hectare - may be useful to compare intra-farm activities. If we ignore cross-activity interactions (mentioned above), then a relatively low per-unit profit result may suggest that a farm is badly using the relevant inputs; it could reallocate some of these inputs to other uses, and increase overall farm profit. A farm that chooses the profit maximizing input mix, given input prices, is called allocative efficient.

However, we need to judge allocative efficiency in the light of factors such as risk. Some farmers are relatively more risk averse (they will more actively try to avoid risk). They might do this, for example, by diversifying production to several output classes. This allows the farmer to lower his risk of a large loss in anyone year from bad weather or prices; but this comes at the cost of a potentially huge return if all goes well. Specifically, in a mixed wheat-wool farm, the impact of a fall in wheat prices may be buffered by the farm's wool output. An analyst needs to take account of this; if an analyst assumes all farmers have the same risk aversion, they may judge a more risk averse farmer as allocative inefficient when in fact he is efficient given his risk preferences.

1.2.3 Relative Profitability

Absolute farm profit may be a misleading indicator of performance across farms. For example, one farm may have a lower level of absolute profit because it has a smaller scale of operation, that is, it may still place its resources in high-valued uses, but its overall profit simply reflects the fact that it uses less resource to produce less output.

Relative profitability, on the other hand, is readily amenable to comparisons between farms with different scales. Usually, relative profitability measures are expressed as percentages of assets, costs or revenues and therefore take account of different farm scales. For example, two relative measures include total farm profit over total farm asset values (return on assets), or farming gross margin over total farm asset values.

Relative profit measures give the analyst an indication of the wealth being generated across disparate industries. Whereas absolute profit measures (for example, gross-margin per cow) could be useful within an industry, relative profit measures (return on assets) can be used within and across industries.

Although measuring relative profitability is one part of an analyst's exercise, the important part is usually disentangling the reasons for differences in relative profitability, which is more difficult. A range of variables can (and have) been used to try and do this in the past. For example, it would appear that dairy farms with large herds have higher absolute and relative profitability than smaller farms. Some variables that are commonly used to explain relative profitability include farm size, manager's education, access to information, and whether the manager is full-time.

Another variable that is commonly used to explain relative farm profit is geographical location. Location may explain differences in relative profitability within an agricultural industry. For example, climatic disturbances, such as drought, are usually confined to a region; some regions have more fertile soil; regions can sometimes face different policies, etc. These can have a significant effect on relative farm profit. We would expect however, that disadvantaged regions would also have lower land prices; the demand for land of this type would be lower, and this would be reflected in land prices.

1.2.4 Choice of Profitability Measures

The choice of using an absolute or relative profitability measure depends on the task at hand. Absolute profitability is appropriate for analyzing the financial performance of a farm in terms of levels or dollars. Relative profitability, on the other hand, is more relevant for comparisons between farms or between groups of farm. Using both measures would improve profitability analysis by providing more information on the financial performance of farms than is possible by one measure alone.

1.3 Productivity

Productivity is a measure of the output produced per unit input. It is a physical rather than a financial measure, using data on physical quantities of inputs (labour hours, hectares of land, etc.) and outputs (tonnes of wheat, kilograms of wool, etc). We can most easily measure productivity when there is one output and one input. For example, when the output is wheat and the input is labour. Then a measure of productivity could be tons of wheat per hour of labour. Note that productivity is quite different to profit. The latter would take account of receipts (which incorporates the price of wheat) and costs (which would incorporate the price of labour).

Productivity is usually measured as a relative concept; either across farms or across time. The rate of productivity growth (usually the excess of output growth. over input growth) is also an important indicator of economic viability of a farm or an agricultural industry. If the productivity growth of an international competitor (like the New Zealand dairy industry) were far outstripping Australia's, then we would expect the competitor to win existing and new markets on the basis of their price per unit, thereby displacing Australia's sales on the world market.

An important concept of productivity analysis is technical efficiency. This is a farm-level concept. It measures how efficient one farm is, relative to the best farm around at the time (the market leader, if you like). The market leader(s) could be seen as the yardstick(s) for all other farms.

However, the market leader can only be as good as the local setting (policy, land quality, etc.) and technology (determined by research) allows it. A farm doing the absolute best it can give the local settings is said to be on the local production frontier (the term frontier is used to show it is at the forefront of technology). Conversely, the further away a farm is from the frontier (the further behind the market leader), the less technically efficient it is, and the greater scope it has to improve its technical efficiency (it has greater scope for 'catch up'). If a farm is not technically efficient, it is unlikely to be viable in the long-term.

In contrast to the farm-level concept of technical efficiency, technological progress represents a shift outwards of the frontier; it allows all farms (including the previous market leader) to improve productivity. In other words, the boundary (the goal posts for the farm) has moved. Technological progress is an aggregate concept; it is relevant to an industry rather than a farm. Technological progress changes the scope of all farms to transform inputs into outputs. It does not depend on how many farms adopt the new technology but the fact that the potential for more efficient use of inputs is now possible for all farms. Whereas a farm could improve its technical efficiency without the other farms being affected, technological progress redefines best practice for everyone. For example, a new crop variety may affect the ability of all crop farms to increase yield per hectare without

increasing input use. The rate of technological progress is an important indicator of long-term economic viability of an industry.

This section will discuss two ways of measuring productivity: partial and total factor productivity measures. We will discuss partial productivity measures first.

1.3.1 Partial Productivity

When total output or a subset of total output is measured in relation to a subset of inputs, this is called a partial productivity measure. Crop yields per hectare and milk per cow are two examples of partial productivity measures. However, these measures, as their name suggests, are incomplete depictions of productivity changes that may be occurring on a farm. To interpret these measures as total farm productivity changes would be misleading because partial productivity measures, by definition, do not include the full set of inputs (or sometimes outputs). For example, a crop-wool farm may experience an increase in crop productivity but also a large decrease in wool productivity, if the latter effect dominates, total farm productivity may fall.

While partial productivity measures may be inadequate to analyze overall productivity changes occurring on a farm, these measures are potentially useful in identifying sources of changes. This is because their partial nature allows these measures to focus on specific parts of the farm. Further, partial measures are often easy to calculate.

For partial productivity measures to be useful they should be carefully defined so as to take account of the most relevant information. For example, if we are interested in dairy production, we may want to consider how much feed is used to produce a litre of milk. However, we would be less interested in knowing fuel costs per litre of milk, since fuel is relatively less important in dairy production.

1.3.2 Total Factor Productivity

Total factor productivity (TFP) measures how much farm output is produced in relation to total inputs. By analyzing TFP changes we are able to determine the relative economic viability of a farm or agriculture industry. TFP analysis implicitly analyses both the technical efficiency (movements towards the frontier) and the rate of technological progress of farms (movements of the frontier).

TFP analysis is potentially a useful tool in analyzing economic viability of farms, but an analyst needs to take care with how she or he measures outputs and inputs. Since TFP includes all outputs and inputs, but productivity is a physical measure, then the analyst must add things that are in different units. For example, labour hours and tonnes of fertilizer. There are several techniques economists use to do this: index numbers, linear programming, and regression. T.C.Chandrashekar (2012) contains information on all these techniques. Economists also need to be careful about how they measure output and input quality.

Consider, for example, if we want to measure the productivity of wool specialist farms. Wool is an output that comes in varying degrees of quality. To capture quality improvements, an analyst would need to make sure he had disaggregated data on different wool types; the quantity of production of each of these types; and the price of each of these types. Unless these data were available, the analyst would struggle to measure quality improvements. Therefore, different quality outputs and inputs need to be treated, essentially, as different outputs and inputs. This may place quite costly demands on the analyst.

1.3.3 Productivity versus Profitability

In this Chapter, we have explained the difference between productivity and profitability. Productivity is a measure of output per unit inputs. It is a physical concept. Profit is a measure of receipts minus costs. It is a financial concept. Both concepts are important when evaluating the health of a farm/industry. They analyze different aspects of performance. In Figure 1, we graphically represent the relationship between productivity and profitability. All else held constant, a productivity improvement will increase profit, through its effect on the way inputs are transformed into outputs: more output (and hence revenue) will be produced from the same inputs (same costs).

Usually, productivity improvement occurs over a period of time (like 5 to 10 years). This means it will be happening concurrently with other changes. For example, output prices may be falling relative to input prices. If the latter effect is very large, it may negate or overturn the positive effect that a productivity improvement would have had on profit. Conversely, if output prices are rising relative to input prices, then this will enhance the effect of a productivity improvement, giving a farm two sources of profit gain over the relevant time period.

All else held constant, a rise in output prices relative to input prices will improve profit. The farm's revenues will increase at a faster rate that its costs. Hence, revenue minus costs (profit) will increase. This increase in profit, on its own, will not improve productivity. However, higher

profits could be invested in new technologies that would improve productivity. For example, if a farm were to experience several profitable years in a row, it could probably afford better technology, and therefore have greater scope to improve its productivity. By contrast, if a farm were to have several unprofitable years, it would probably view an investment in new technology as unaffordable.

An analyst may look at a farm's profitability to determine if it is viable in the short term. However, to investigate other questions-for example, the impact of technological change on an industry-an analyst may need to consider productivity. The reason for this should be straightforward given the above discussion. Technological progress may have a very large impact on an industry and significantly improve its productivity. However, if foreign firms have improved their productivity at the same rate, then there may be little or no change in the domestic industry's financial performance (international competition would have pushed the price of the commodity downwards). This is not to say that technological progress had no impact.

Quite the contrary, without technological progress domestically, the industry would decline in size relative to its international competitors, since it would have been outperformed in international and domestic markets. Rather, in this case technological progress should be judged to have maintained the viability of the industry; technological progress allowed the industry to remain on the treadmill.

Figure 1: Graphical Presentation of the Relationship between Productivity and Profitability.

Figure

1.4 Model of Productivity and Profitability

We developed a farm model to analyses the impact of four changes - output price, input price. farm-specific knowledge, and sector-wide knowledge - on the farm's productivity and profitability. We call the initial situation that of a farm the ‘base scenario’, and we call the post-change situation the 'alternative scenario'.

Our model farm maximizes gross margin - the surplus between revenue and variable costs - and takes output and input prices as given. The farm maximizes gross margin by choosing its output and input levels. We assumed that the farm has one output and four inputs - hired labour, materials, land and capital. However, the farm treats the amount of land and capital as fixed inputs (in economic parlance, this is a 'short-run' analysis). This means the farm cannot adjust land and capital in reaction to the change (in price, etc). Hence, the farm can only vary hired labour and materials. The Appendix provides a more technical exposition of the model.

In our base scenario, we assumed a given set of parameters (output prices, input prices, farm knowledge and sector-wide knowledge). Then, we ran four alternative scenarios to compare with the base scenario. The four alternative scenarios that we ran were:

1. fall in output price;

2. rise in hired labour wage rate;

3. a movement towards inefficiency for a farm (eg, a farm moving to an inefficient scale); and

4. An improvement in agricultural practices.

Except for the third scenario, all of these scenarios

represent events beyond the control of the farm. We compared each alternative scenario to the base in terms of:

1. farm gross margin; and

2. Farm productivity (using a Fisher total factor productivity index).

The Fisher TFP index measures take a value of one in the base scenario. If an alternative scenario does not change farm productivity, the index remains at one: If an alternative scenario increases productivity, the Fisher index rises above one. If an alternative scenario decreases productivity the Fisher index falls below one.

1.4 .1 Base Scenario

Before we proceed with discussion of the results, we will make some important points about the base scenario. We assumed a particular form of technical relationship between inputs into output, that is, we assumed a particular form of the 'production function. We included a parameter in the production function that represented the industry's level of technology and knowledge. This parameter also includes the managerial expertise of the farmer. The appendix provides more details on this variable. This was an assumed value.

As stated above, our model farm produces one output. This is relatively more accurate in the case of dairy and specialist livestock farms, but is probably not an adequate representation of cropping or mixed cropping-livestock farms. However, this does not alter the results of our subsequent analysis.

1.4.2 Fall in Output Price

The impact of a 25 per cent fall in output is given in Table 1. The fall in output price lowered the farm's gross margin. The farm's gross margin fell by nearly 20 units. This represents a fall of gross margin of around 27 per cent. The farm responded to the fall in output price by both lowering labour input use and materials use from 0.4 to 0.3 to reduce total costs (Table 1). This caused output to fall from 3.5 to 3.41 units and compounded the decline in total revenue (Table 2). This new output level was the new profit maximizing level because the fall in output price made production less profitable.

From Table 1, we can see that a 25 per cent fall in output price had no effect on productivity. This is because the change in output prices does not change the technical ability of the farm to transform inputs into outputs. Yet, even with the same ability to get outputs from inputs, the farm's profit falls because it receives less revenue from each output unit.

TABLE 1: CHANGE IN PROFITABILITY AND PRODUCTIVITY IN 'FALL IN OUTPUT PRICE' SCENARIO

Variable/Scenario	Base	Fall in Output Price	Change (%)
Gross Margin	63.98	46.69	27.02↓
Productivity Index	1	1	No Change

Note that a fall in output price is not the same as a change in the quality of output (like, for example, a fall in the protein content of milk). A change in output quality alters the ability of the farm to convert inputs to outputs and therefore, it affects productivity (similar to a change in Agricultural Practices - see below).

1.4.3 Wage Rise

We can see from Table 1 that gross margin fell - by 1.4 per cent - in response to a 25 per cent wage rise. The farm responded to the increase in wages by reducing the quantity of hired labour input from 0.4 to 0.32 units (Table 1). The other variable input, materials, was left unchanged at 0.4 units (Table 1). The farm's total variable costs remain unchanged. Since hired labour falls, output also falls slightly (to 3.45 units) which in turn generates less revenue (Table 2. This causes a fall in the farm's gross margin. A 25 per cent increase in wages has no an effect on productivity (Table .2) Like a fall in output price, a fall in wages (or other input prices) does not affect the technical relationship between outputs and inputs.

TABLE 2: CHANGE IN PROFITABILITY AND PRODUCTIVITY IN 'WAGE RISE' SCENARIO

Variable/Scenario	Base	Wage Price	Change (%)
Gross Margin	63.98	63.09	1.4↓
Productivity Index	1	1	No Change

1.4.4 Inefficient Farm

We simulated a model farm's move towards inefficiency, by moving it from fully efficient in the base scenario, to 75 per cent efficient in the alternative scenario. This assumption allows us to simulate technical inefficiency. Essentially, our model farm in the alternative scenario produces 75 per cent less output from the same inputs.

This case could represent, for example, a change in ownership of the farm from an experienced, well-trained person, to a less-experienced manager; a change in farm-specific knowledge. The new manager may not use all the land to the maximum possible extent (does not spread fixed costs as well as he should) or just combine variable inputs in a poor manner.

From Table 3 we can see that the farm gross margin falls nearly 20 units. The inefficient farm uses the same quantity of inputs as the base farm. Therefore, total variable costs remain the same. Production falls from 3.5 to 2.62 units. This result in lower revenue of 52.49 compared to 70 in the base Constant costs combined with lower revenue lead to a fall in gross margin.

The productivity index also falls by nearly 0.2 index points (Table 3). A 25 per cent reduction in the output that can be produced from given inputs is clearly a productivity loss.

TABLE 3 CHANGE IN PROFITABILITY AND PRODUCTIVITY IN 'INEFFICIENT FARM' SCENARIO

Variable/Scenario	Base	Inefficient Farm	Change (%)
Gross Margin	63.98	46.69	27.34↓
Productivity Index	1	0.87	13.4↓

1.4.5 Improvement in Agricultural Practices

We simulated an improvement in agricultural practices as a 25 per cent increase in the industry's technology and knowledge or the farmer's human capital. This scenario can be seen as a simulation of technological progress. This change might represent, for example, a new breakthrough by one of the rural research corporation projects; a change in knowledge that affects the whole sector (industry). A higher yielding or better quality crop variety, better pasture management, or an improvement in livestock genetics could all be represented as a shift of the production function that this scenario emulates.

Table 5 shows that an improvement in agricultural practices increases gross margin by nearly 5 units. Output rises (from 3.5 to 3.72) and hence so does revenue (70 to 74.45) (Table 5). However costs remain the same. Therefore, gross margin rises.

The productivity index increases by nearly 7 per cent in this scenario (Table 3). The improvement in agricultural practices allows the model farm to produce more output with the same inputs (Table 4).

TABLE 4 CHANGE IN PROFITABILITY AND PRODUCTIVITY IN 'IMPROVEMENT IN AGRICULTURAL PRACTICES SCENARIO

Variable/Scenario	Base	Improvement in Agricultural Practices	Change (%)
Gross Margin	63.98	68.45	6.98↑
Productivity Index	1	1.06	6.38↑

TABLE 5 SUMMARY OF SELECTED VARIABLES, BASE VERSUS ALTERNATIVE SCENARIO

	Scenario				
Variable	Base	Fall in Output Price	Wage Rise	Inefficient Farm	Improvement Ag. Practices
(1)	(2)	(3)	(4)	(5)	(6)
Price[a]	20	15	20	20	20
Output[b]	3.5	3.41	3.45	2.62	3.72
Total					

TABLE 5 SUMMARY OF SELECTED VARIABLES, BASE VERSUS ALTERNATIVE SCENARIO—*CONTD.*

Variable	Base	Fall in Output Price	Wage Rise	Inefficient Farm	Improvement Ag. Practices
(1)	(2)	(3)	(4)	(5)	(6)
Revenue[b]	70	51.19	69.09	52.49	74.45
Labour units hired[b]	0.4	0.3	0.32	0.4	0.4
Wages[a]	10	10	12.5	10	10
Labour Cost[c]	4	3	4	4	4
Materials units used[b]	0.4	0.3	0.4	0.4	0.4
Unit cost of Materials[a]	5	5	5	5	5
Materials Cost[d]	2	1.5	2	2	2
Total Variable Cost[e]	6	4.5	6	6	6
Gross Margin [f]	63.98	46.69	63.09	46.49	68.45
Gross Margin Changes	NA	-27.02	-1.4	-27.34	6.98
Productivity Index (%)	NA	1	1	0.87	1.06
Change in Productivity (%)	NA	0	0	-13.4	6.38

Notes to Table: a. assumed to be determined external to the farm

b determined by the farm model

c Labour units hired multiplied by Wages

d Material units used multiplied by unit cost of Materials

e sum of Labour Cost and Materials Cost

f Total Revenue minus Total Variable Cost, NA not applicable.

1.5 A Technical Explanation of Methodology

1.5.1 The Model

We use a logarithmic Cobb-Douglas production function with four inputs. Two are variable and the other two are fixed. We restrict our analysis to how the farm behaves in the short-run. The production function can be written as:

$$Q = \ln A + \alpha \ln L + \beta \ln K + \gamma \ln M + \delta \ln H + \varepsilon \quad (1)$$

Where, Q is output;

A is an exogenous variable representing the human capital of the farmer or the state of technology;

L is the quantity of hired labour units used;

K is the quantity of physical capital units used;

M is the quantity of materials units used;

H is the quantity of land units used;

α, β, γ and δ are the technical coefficients of L, K, M and H respectively; and

£ is a stochastic error term with a mean of zero.

The production function is assumed to have constant returns to scale so 0., /J, y and c5 sum to one. L and M are assumed to be variable inputs. K and H are assumed to be fixed inputs because of the short-run nature of the analysis. K and H cannot be adjusted in the short-run because we assume it would take more than one period to change and for the effects to become observable.

Now, we turn our attention to the profit function. Profit can be written as: Where,

$$\Pi = PQ - wL - rK - qM - zH$$

Where, II is profit ;

P is the price of output;

W, wages for hired labour;

r, is the price of physical capital;

q, is the price of materials; and

z is the price of land.

Substitute (1) into (2) yields the following profit function:

$$\Pi = P(\ln A + \alpha \ln L + \beta \ln K + \gamma \ln M + \delta \ln H - wL - rK - qM - zH \quad (2')$$

Because we assumed that the farm is a profit-maximizer, the first order partial derivatives for the variable inputs L and M were obtained to determine the ·optimal quantity of variable input use:

$$\frac{a\Pi}{aL} = \frac{\alpha P}{L} = w = 0 \quad (3)$$

$$\frac{a\Pi}{aM} = \frac{\alpha P}{M} = q = 0 \quad (4)$$

Equations (3) and (4) imply that the marginal productivity of labour and materials is equal to wages or the price of materials respectively. Because we assumed that the farmer is profit-maximizing, these equations say that the farm will buy labour and materials inputs until their respective marginal product equals their respective marginal costs. Rearranging equations (3) and (4) yields the farm's demand for labour and materials respectively:

$$L = \frac{\alpha P}{w} \quad (3')$$

$$M = \frac{\gamma P}{q} \quad (4')$$

Equations (3 ') and (4') state that the farm's demand for labour and materials depends on the price of output the respective technical coefficients and the respective price of the input. The farm will buy hired labour and materials, until the quantity of the respective inputs equal the ratio of the input's share of average gross revenue (or output price) to its marginal cost (or its input price).

The inputs K and H are assumed to have been fixed as explained previously. The farmer, therefore, maximizes profit given the initial quantities of K and H. The choice variables are L and M which are selected to produce a level of Q that will maximize equation (2').

1.5.2 The Productivity Index

A variation of the Fisher index was used to analyse the change in total factor productivity (TFP) from the base to the alternative scenarios. We will take TFP to mean the ratio of the quantity of output to the quantity of inputs.

To construct the Fisher index, the Laspeyres and Paasche indexes need to be constructed. The Laspeyres index calculates TFP assuming that the level of input use in the alternative scenario is the same as in the base. Conversely, the Paasche TFP index assumes that the level of input use in base scenario is same as in the alternative one. This allows us to isolate productivity changes arising from technological progress.

We can write the Laspeyres and Paasche indexes respectively as:

$$TFP^L = \frac{Q^1(L^b, M^b)}{X^b} = \frac{Q^b(L^b, M^b)}{X^b} = \frac{Q^1(L^b, M^b)}{Q^b(L^b, M^b)} \quad (5)$$

$$TFP^p = \frac{Q^1(L^1, M^1)}{X^1} = \frac{Q^b(L^1, M^1)}{X^1} = \frac{Q^1(L^1, M^1)}{Q^b(L^1, M^1)} \quad (6)$$

Where, TFP^L and TFP^P are the TFP index for Laspeyres and Paasche respectively;

Q^b and Q^s are the production function for the base and alternative scenario respectively;

(L^b, M^b) and (L^S, M^s) are the variable inputs used in the base and alternative scenario respectively;and

X^b and X^s are the total inputs used in the base and alternative scenario respectively.

We can use equations (5) and (6) to construct a Fisher index of TFP (TFP^F) :

$$TFP^F = TFP^L \times TFP^P \quad (7)$$

We analyze percentage changes In TFPF relative to the base for each alternate scenano.

1.5.3 Profitability

We analyze profitability using gross margin. Gross margin was used rather than economic profit because of the ease in analyzing changes using gross margin. Economic profit equals zero in the base scenario because we assume the farm is producing in equilibrium on the production possibilities frontier. As a result, relative changes of economic profit in the alternative scenarios would be divided by zero,

We use gross margin because we do not have to impose any assumptions on this measure.

We know gross margin will never equal zero in this model because we assume that fixed costs are always greater than zero. Furthermore, gross margins are

comparable between the base and alternative scenarios because we have assumed that the stock of K and H are the same for every scenario.

Gross margin (GM) can be written in algebra form as follows:

$$GM = TR - wL. - qM \quad (8)$$

We analyze changes in gross margin in percentage form.

1.6 The Scenarios

This section will describe how we simulated the base and alternative scenarios. We can divide the scenarios into three groups: the base, price shock scenarios and the production shock scenarios. We will discuss the base scenario first.

1.6.1 The Base Scenario

There are five variables in the production function that are exogenously determined in the production function. Table 6 contains the assumed values we gave each of the exogenous variables in the production function.

TABLE 6 VARIABLES AND RESULTS FROM THE MODEL

Variable	Scenario				
Production Function	**Base**	**Fall in Output Price**	**Wage Rise**	**Inefficient Farm**	**Improvement in Ag. Practices**
α^a	0.2	0.2	0.2	0.2	0.2
β^a	0.5	0.5	0.5	0.5	0.5
γ^a	0.1	0.1	0.1	0.1	0.1
δ^a	0.2	0.2	0.2	0.2	0.2
A^a	10	10	10	10	12.5
L^a	0.4	0.3	0.32	0.4	0.4
K^a	11.35	11.35	11.35	11.35	11.35
M^a	0.4	0.3	0.4	0.4	0.4
H^a	3.61	3.61	3.61	3.61	3.61
Efficiency^a	1	1	1	0.75	1
Output	3.5	3.41	3.45	2.62	3.72
Profit Function					
P^a	20	15	20	20	20
W^a	10	10	12.5	10	10
r^a	5	5	5	5	5
q^a	5	5	5	5	5
z^a	2	2	2	2	2
Gross Margin	63.98	46.69	63.09	46.49	68.45
Change from Base (%)	NA	-27.02	-1.4	-27.34	6.98
Fisher TFP Index	1	1	1	0.87	1.06
Change from Base (%)	NA	0	0	-13.4	6.38

Notes to Table:
a exogenous variable
b endogenous variable
NA not applicable

These technical coefficients can be viewed as the inputs' technical relationship to output.

The variable, A represents the state of technology.

Table Al also contains the values for the endogenous variables *L, K, M* and *H*. The variable inputs *L* and *M* were determined using equations (3') and (4'). *K* and *H* were determined by solving (2') for IT = 0 and satisfying the first order conditions (3) and (4).

Table 6 also contains information on the variables of the profit function. All of these variables were exogenously determined. We assumed that the farm is a price taker so prices are given. These values are hypothetical and should be treated as such. Obviously, a change in these variables is likely to change the way the farm allocates resources as described in the model section.

Table 6 contains the initial production level and gross margin for the base scenario. Production is 3.5 units and gross margin is 63.98.

1.6.2 Price Shocks

We ran two price shock scenarios: a 25 per cent fall in output price and a 25 per cent rise in wages. These two scenarios were run to analyse the impact of changes in output and input prices respectively.

The fall in output price was simulated by reducing P from 20 to 15. The farm's profitability fell by over 27 per cent. Input use fell in response to lower profitability. The resulting lower output also contributed to the farm's reduced profitability. However, the productivity index did not change because the farm did not change the way it transformed inputs into output.

We simulated the wage rise scenario by increasing w from 10 to 12.5 (table 6). Profitability fell by around 1.4 per cent for the hypothetical farm. This was mainly because of higher wages the farmer had to pay. However, the fall in profitability was relatively low. Recall from equation (3) that the marginal productivity of labour is equal to the wage. By raising the wage, the marginal unit of labour became more productive.

The increase in wages here is almost fully offset by the farmer reducing hired labour inputs and higher labour productivity.

The increase in marginal labour productivity does not imply that the farm had a higher TFP index value. Productivity change was zero for this hypothetical farm because the farm did not undertake technical change of its production function.

1.6.3 Production shocks

The remaining two scenarios were shocks to the production function. This meant that the production function was changed in an exogenous fashion.

The first scenario we ran, the inefficient farm was simulated by assuming it was 75 per cent less efficient in transforming inputs into output than the base case (table 6). This meant we simply multiplied the base case production function by 0.75. Equation (1) can be rewritten as:

$$Q \text{ x } Efficiency = Efficiency \text{ x } (\ln A + \alpha \ln L + \beta \ln K + \gamma \ln M + \delta \ln H) \quad (9)$$

Where, Efficiency is the degree to how efficient the farm was. If Efficiency was less than one, then the farm is inefficient.

By simulating inefficiency this way, we are assuming that the farm is not operating on the production possibilities frontier of the base scenario. We effectively imposed the restriction that it uses the same inputs for given output and input prices than the base scenario to produce 75 per cent less output; ie the farm is technically inefficient. This scenario can be seen as a simulation of a farm managed by an experienced farmer.The inefficient farm experienced a decline of profitability of over 27 per cent than the base case. This was from using the same quantity of variable inputs and therefore unchanged costs but from reduced output. Output fell from around 3.5 to approximately 2.6 units. As a result, total revenue fell while variable costs remain the same. The fall in output caused the fall in gross margin. The TFP index fell by over 13 per cent. Given that we have imposed the restriction that the farm is not producing on the production frontier, this result is the correct one from a theoretical perspective. The hypothetical farm did not produce at the production frontier and did not achieve the productivity level as in the base case. T.C. Chandrashekar point out; the Cobb-Douglas production function assumes that the farm is producing at the production frontier.

We simulated the next scenario, improvement in agricultural practices, by assuming that A increased from 10 to 12.5. This simulates that technological breakthrough regarding agricultural production has occurred. Thus, the farm moves to a higher production possibilities frontier. This assumes that the farm is moves to the frontier. Again,

we impose the condition that the farm uses the same level of inputs for given output and input prices as the base. This causes a change in the production function. Output increases from around 3.5 to over 3.7 whereas variable inputs remained the same.

Gross margins increased by nearly seven per cent. This gain was entirely made up by higher production. Productivity also increased over six per cent. Again, this was entirely made up by increased production. That is, the farm is now able to produce higher output with the same level of inputs. It has shifted to a higher production function.

1.7 Costs-Benefit Analysis

To assess the acceptability of the alley farming technology, it is essential to specify its structural and functional aspects, namely: species, propagation, spacing, establishment, fertilization, weeding, plant protection, harvesting, etc. On this basis, one can answer the following questions:

1. What are the resource requirements for all operations?

2. What is the magnitude of real benefits in relation to the farmer's objectives?

3. What are the net returns per unit of land, labor, and/or cash inputs, in the short-term and long- term?

4. To what extent can the technology's benefits be predicted under favourable and unfavourable conditions?

5. What is the anticipated time scheduling for successful establishment of proposed changes and realization of benefit streams?

Such information is derived from both on-station and on-farm research. If only on-station results are used, there tends to be an unintentional effect of overestimating the real benefits and of underestimating the real costs of the technology for the farmer. The most serious constraint to analysis is the probably current scarcity of scientific information on many structural and functional aspects of alley farming.

1.7.1 Adoption of Indian farming: five major issues

Research has been conducting socio-economic assessments of alley farming in INDIA since the early 2000s. There is still a great deal of work to be done in this important field of research. However, experience so far has identified the major factors that should receive prominent attention.

A later section (6.5) will cover the issues which relate to the diffusion of Indian farming across india. This section (6.4) presents five major socioeconomic factors which determine whether individual farmers and communities choose to adopt alley farming technology, namely:

1.7.2 Land and Tree Tenure Systems

Indian farming involves planting trees in addition to annual crops. Tree planting may be subject to special rules. Some people may not be allowed to plant trees or may need to get the permission of another person before planting. These rules vary from region to region and even from village to village, so it is impossible to generalize about them. However, researchers and extension workers should consider the following factors when advising farmers on alley farming (or on tree planting for other purposes):

1. Different land-tenure rules may apply to different categories of land. For example, in many parts of southeast Nigeria, compound land is distinguished from other farmland, and within farmland, "near fields" from "distant fields". While an individual householder will usually be allowed to plant trees around his own compound, this may not be the case with other categories of land.

2. The various members of a household (adult males, adult females, children) may have different kinds of rights over land. In many areas, women are not considered to be owners of land, and may need permission from their husbands before planting trees. However, this need not prevent them from practicing alley farming.

3. People renting land, whether they are from the same community or from outside the community, may have only short-term rights over land, and therefore, may be unable to plant trees. In other cases, tenants are able to plant trees if they obtain the landowner's permission.

4. In some areas, the community or the extended family may exercise control over the use of land. Land (or some types of land) may be shared out annually by the group, so that the individual farmer will be unlikely to have the same piece of land in the next season. In other cases, the community may dictate the cycle of land rotation. In either situation, the farmer will have little incentive to plant trees, even if he is allowed to, because it is unlikely that he or she will gain the long-term benefit.

The issue of tree tenure is separate from that of land tenure. Rights over trees are often distinct from rights over land. According to TC Chandrasekhar (2013), issues under tree tenure include the right to own or inherit trees, the right to plant trees, the right to use trees and tree products, the right to dispose of trees, and the right to exclude others from the use of trees and tree products.

These various rights differ widely across cultural zones and have a major influence on the social acceptability of alley farming and other agroforestry interventions. In some areas, planting a tree may give the planter rights over the land on which it is planted. In such situations, planting of trees by people with temporary claims to land is usually met with suspicion and opposition by landowners.

1.7.3 Labour Requirements

The main cost of alley farming to the farmer is the extra labor involved in establishing trees and pruning the hedgerow trees. Estimations of labor requirements fall in the range of 40 to 85 hours/ha/pruning in a four-meter alley system. One to three pruning may be required per cropping season. Some extra labour may also be involved in carrying foliage to animals.

These labour costs may be partially or completely offset because alley farming reduces the need for labour for clearing new land. Additionally, alley farming may reduce labour for weeding and for collecting animal feed from the bush. If the alley farm is established by direct seeding, the labour requirements for planting are small (in wetter environments).

Available information on the labour requirement for alley farming is scanty and variable. However, in general, the system appears to require less total labour than conventional bush- fallow farming. The labour costs and the net returns to labour are major determinants of the overall profitability of alley farming. Labour costs may become an important concern if the additional labour has to be hired and/or supplied by the household at peak labour periods in the agricultural calendar.

1.7.4 Management Complexity

Indian fanning is a composite technology involving trees and/or food crops grasses and/or animals. It is thus a fairly complex and management-intensive technology, requiring careful planning, timely implementation, and close supervision. For both tree and crop components, it is essential to obtain good planting materials, establish them in the right season, use an appropriate combination of plant spacing's, manage them to reduce competition (e.g., shading, water use), monitor pests and diseases, protect trees in the off-season (especially against small stock), make sure that MPTs do not invade the alleys, etc. If the farmer does not manage the components properly, he or she may experience serious problems. Such regimes probably require progressive farmers with good management skills or farmer training before implementing the technology. Even extensionists may experience problems with alley farming because it requires a multi-commodity/multi-disciplinary systems strategy.

Tree management, in particular, may present some difficulty to farmers. Although farmers are familiar with the management of trees under the bush-fallow system and plantation tree crops, tree management under alley farming may involve a number of innovative activities, namely:

* planting and establishing trees within arable farms;

* managing the trees for optimum productivity to provide mulch and fodder,

* cutting and carrying foliage to feed animals;

* altering land use and rotation patterns.

Learning these innovations may require time and effort, affecting the speed and ease of adoption.

1.7.5 Differential Social Prospects for Adoption:

The issue of social security and equity should always be considered when the introduction of a new technology is planned. What will be the impacts of alley farming technology on the roles, priorities, and opportunities for men, women, and children in the household and community? What will be the prospects of adoption by different types of households and farmers (e.g., resource-rich, resource-poor, women farmers). While it is unfair to expect any technology *per se* to adequately address these socio political concerns, alley farming can be expected to have different effects on various types of households. It is essential to identify them early in the process of technology development.

For example, levels of education, both formal and informal have been found to influence technology adoption through four effects:

* the innovation effect, whereby better educated farmers know the why, what, when, and how of the technology, its cost and benefits, and where to look for information and capital;

* the allocation effect, whereby optimal choices in the use of available resources are made;

* the worker quality effect, whereby tasks are performed better,

* the externality effect, whereby others are helped to learn and adopt.

A generation of adoption studies have emphasized the role of education in adoption. Even where larger farm size and greater extension contact were found important variables in adoption, both of these variables were found to be highly correlated with the level of education.

Experience with the Green Revolution in Asia shows that, although the technology packages were originally characterized as scale-neutral, large farms became early and major adopters. Thus, a technology may itself be scale-neutral, but returns to scale may prevail in adoption, because of the ability of the large farms to spread learning and acquisition costs over a larger volume of output.

Large farmers usually have better access to information and capital because of their better education and greater contact with the supply sources related to the technology. They can become the early adopters and derive the benefits of early adoption such as premium returns and capitalization of those returns in increased investment. Unless special programs for information dissemination to the resource-poor farmers are promoted, such farmers are likely to remain as laggards and miss the benefits of a new technology.

1.7.6 Overall Profitability and Acceptability

When all the costs and benefits are taken into account, is alley farming profitable? This critical issue has received increasing attention from researchers in recent years. They have examined the profitability question from two perspectives: the costs and benefits for the farmers, and those for society as a whole. Small-scale farmers tend to be most concerned with the short- and medium- term costs and benefits. Alley farming increases their crop yields and animal productivity. It also allows them to extend the cropping period, reducing the area of land that would be needed under the bush fallow system. Alley farming does not require capital outlay other than for seed. Because it reduces, or eliminates, the need for fertilizer, it may actually result in a saving of short-term capital. The extra costs of alley farming must be balanced against these benefits and savings. The major cost factor, as mentioned previously, is increased labour.

Research has shown that alley farming with crops only (no livestock component) is more profitable than traditional bush fallow rotation. The calculations assume a foliage yield of three tonnes of dry matter per hectare and a labour input for pruning of 18 person-days per year. Studies have found the net value of alley farming to be 14 to 59% greater than the bush fallow system. Alley farming with a livestock component will be profitable if it increases net output by 20-30% for sheep and 30-40% for goats - assuming that 25% of the hedgerow foliage is fed to the animals. The attractiveness of alley farming to farmers under appropriate conditions has been demonstrated by the spontaneous spread of the technology from pilot project areas. for example, in southwest India. Tangible benefits of alley farming are not always apparent to farmers in the establishment phase.

During carefully managed on-station trials by trained personnel, lIT A's prototype maize/cowpea system begins to improve yields significantly in the second year. Under less favourable conditions on actual farms, however, the improvement usually does not show until the third year after the hedgerows have been planned. The trees have to be established and well-maintained for roughly 10-15 years in order to derive significant long-term benefits. The tree can also provide indirect benefits, such as in yam staking (Table 6). This initial time lag may pose a constraint to small farmers. Even when they have a pressing need to conserve soil fertility, their staying power for the initial period may need to be enhanced through incentive structures such as soft credit. Farmers have indicated their willingness to plant trees under three conditions:

1. Ability to secure tree seedlings at no cost;

2. Possibility of inter planting trees with food crops without adverse effects on crop yields;

3. Possibility of earning some income from the trees (e.g., sale of stakes).

TABLE 7 Economic Returns to Yam Staking in the South India State, the Profitability of Alley Farming Improves in Areas Where Tree Products Such as Stakes or Fuel Wood Have a High Value.

Village	Yield (t ha^{-1})[a]		Yield increase		Value of yield increase	Benefit/cost
	Staked	Unstaked	(t ha^{-1})	(%)	(Rs. ha^{-1})[b]	Ratio[a]
A	25.5	6.9	18.6	269	3627	10.4
B	12.1	7.1	5.0	70	990	2.8
C	20.0	I 1.0	9.0	81	1782	3.1
D	33.5	17.7	15.8	89	3128	8.9
E	19.4	10.5	8.9	85	1762	5.0
F	27.7	20.8	6.9	33	1366	3.9
G	18.0	17.0	1.0	6	198	0.6
H	30.5	23.0	7.5	33	1485	4.2
Average	23.3	14.2	9.1	83	1801	5.1

(a) Benefit cost ratio is derived by dividing the values of increased yield by the cost of cutting and carrying leucaena stakes

Recent research in India and elsewhere has shown that socio-economic acceptability relies very heavily on cost-sharing devices between government and rural farmers, as well as on the availability of an active and persistent extension service, and the potential for some direct economic output from the trees in the system.

The benefits to society as a whole are mainly long-term in nature: resource conservation for future generations, stabilized and sustainable food and livestock production systems, reduced reliance on imported chemical fertilizer and/or protein feeds, a stronger rural economy. The long- term benefit of alley farming for soil conservation may not be easily apparent, particularly if land is not scarce. This is because soil degradation occurs slowly, so its implications are also understood slowly. Researchers have argued that policy makers should consider the benefits of alley farming in a national context when deciding whether or not to subsidize adoption of the technology by farmers.

1.8 Summary

In this study, we have highlighted the difference between productivity and profitability. Productivity is a measure of the output produced per unit input. 'Productivity change' is a measure of the change in this ratio. Profit is a measure of the excess of receipts over costs. Often it is measured as a ratio. For example, profit relative to total assets. There are many different productivity and profitability measures. Each of these has a particular use. The user needs to ensure that he uses the right statistic for the task at hand.

This report shows that a productivity change, all else constant, will raise profit. By improving productivity, a farm is able to produce the same output using less input, or more output for the same input. If prices remain constant, this will increase profit. Productivity is one of the main drivers of profit and, therefore, the viability of farms. However, an increase in profits (due, say, to an output price rise) will not improve productivity if all else is constant. For example, if output or input prices change then profit will also change, but productivity will not; prices have no effect on the way a farm transforms inputs into output.

If a farmer re-invests newly acquired profits in new technology, training or expansion, then this may - subsequently - improve productivity. Farmers who finance new investment through retained earnings need to build up their investment funds over some time period. A large gain due to (say) a sudden price rise may provide the farmer with enough funds to bring forward their investment plans, and hence invest in new technology relatively early. However, a farmer always has the option of using retained earnings for other things (a new car, his children's education, etc.). The Economics Branch is often interested in productivity measurement and the effect of research on productivity. Research affects the ability of farms to transform inputs into outputs.

Therefore, to evaluate research the economist needs to know how it affects the production function, or

productivity. However, economists are not the only ones that are interested in productivity. Research administrators who allocate resources to agricultural R&D can think of the benefit from their work being derived from improvements in productivity. If research administrators focus on relative productivity gains (and hence benefits) from different research projects, they can better allocate research funds, and hence increase the returns to the community from their investment.

Policy makers that are mindful of the important role that productivity plays in the economy can help ensure the viability of Victoria's agriculture industry. Because prices, and the competitiveness of international competition, do not remain constant, improvements in productivity are needed to ensure that Victorian farms survive. An improvement in an exporting industry's productivity may not improve profits if, for example. international prices fall because overseas competitors are also improving their productivity. Agricultural farms are on a treadmill. Productivity improvements are needed not on Public perception is partly derived from the stock of knowledge in a country. A strong intellectual commitment to alley farming would help to mould public perception in its favour. Agroforestry and alley farming are new sciences, and as yet, many scientists, technicians, and administrators in agriculture have not accepted the concept of growing trees to benefit crops. To thrive, but in many circumstances to survive.

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Projected Demand for Rice in Kerala up to 2026 AD

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Abstract

One important feature of Kerala 's agriculture is the change in cropping pattern in favour of commercial crops. The analysis of cropping pattern shows that the years 1976-77 and 1980-81 marked two important turning points in the cropping pattern. The area under tapioca was at its maximum in 1976-77 and then declined continuously and the area under rice was at its peak in 1980-81 and then continuous decline set in. The area under total food crops rapidly declined since 1976-77. Rice and tapioca lost the maximum area while rubber and coconut gained the maximum area. The statistical profile of Kerala agriculture since 1960, clearly established the decrease in the area under paddy cultivation in the state. Time series analysis of acreage, production and productivity data of rice in Kerala during the five decades from 1960-61 to 2009-10 revealed the performance of this crop in terms of growth of area, production and productivity. The production of major food crop, rice, reached a negative growth rales due to the declining trend of their area. The data reveals that during 1960-61 Kerala had a shortage of rice of about 40.12 percent, which increased to 83.45 percent in 2009-10. The study clearly revealed the increasing demand for rice in Kerala in the coming years compared to the existing supply.

Key words: Kerala; rice; supply demand gap; projected demand.

Introduction

In Kerala, agricultural crops are broadly divided into two classes - food crops and non-food crops. The ratio of food crop area to non-food crop area in the state in 1968-69 was 64:36. But in 1995-96 the ratio was 47:53 and in 2004-05 it was 44: 56. Present trend reveals that Kerala is being converted to non-food crop area and the ratio of food crop to non-food crop area is 12: 88. The main food crop in Kerala is rice. The area under rice during 1967-68 was 48 percent of the total food crop area. But in 1995-96 it was 15 percent and in 2004-05 it was 10 percent. The area under rice was at its maximum in 1980-81; after which decline set in and reached 8.77 percent in 2009-10.

During the span of fifty years from1960-61 to 2009-10, the state witnessed a decrease of 69.92 percent in the area under rice cultivation. In general there is an overall decrease of rice grown area in Kerala. The districts level decrease of rice field area in the state was also very high. The traditional rice growing areas in the state, like, Palakkad and Alappuzha have 49.93 percent and 56.97 percent decline in area during this period. The total rice production during the year 2009-10 also decreased tremendously and widened the supply demand gap of rice in Kerala. In this context, an analysis of the projected demand for rice in Kerala was attempted in this study.

Materials and Methodology

The materials used for the study were collected from various publications of the Government of Kerala like Economic Review, Statistics for Planning and Agricultural Statistics.

Individual demand for rice for the state as a whole is worked out by multiplying percapita consumption of rice with population and aggregated by rural and urban. The projected demand for rice in Kerala up to the year 2026 under different scenarios of growth in income (5 percent to 10 percent) were obtained by using the formulae developed by Sekhon MK, Rangi PS and Tejinder Dhaliwal (2008).

$$Dt = d_{o*} N_t (1+y_* e)^t$$

[Where, D_t = individual demand of rice in year t (2026), d_o = percapita demand

of rice in the base year (2001), N_t(= projected population in year t (2026), y =

growth in percapita income (5 percent to 10 percent), e = expenditure elasticity of demand for rice.]

Rice cultivation in Kerala

In Kerala, out of the total area, the area under rice cultivation had declined from 778.91 thousand hectare in 1960-61 to 234.26 thousand hectare in 2009-10 (a decline of 69.96 percent). Disaggregating the data at the district level, it was observed that, the main rice growing districts like Palakkad and Alappuzha showed 49.93 percent and 56.97 percent decline in area during the time period from 1960-61 to 2009-10. All the districts except Alappuzha, Palakkad, Wayanad and Kasaragod observed higher level of decrease in the area under rice cultivation compared to the state level decline. Decade wise, the decline started after 1970-71 and was severe after 1990-91. Hence from Table 1 the picture emerges that the relative contribution of rice to the total cropped area consistently declined in all the districts in the state.

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TABLE. 1. PERCENTAGE AGE CHANGE IN THE CULTIVATION OF RICE IN KERALA IN DIFFERENT PERIODS

SI. No.	Districts	1970-71 over 1960-61	1980-81 over 1970-71	1990-91 over 1980-81	2000-01 over 1990-91	2009-10 over 2000-01	2009-10 over 1960-61
1	Thiruvananthapuram	5.54	-17.49	-33.47	-67.73	-57.18	-91.99
2	Kollam	12.44	-3.53	-39.04	-51.04	-74.17	-91.64
3	Pathanamthitta	-	-	-	-55.89	-57.30	-81.16
4	Kottayam	25.31	-36.21	-17.81	-36.49	-34.33	-72.60
5	Alappuzha	7.44	-3.25	-26.42	-37.79	-9.53	-56.97
6	Ernaku1am	20.28	9.40	-38.46	-40.66	-65.36	-83.35
7	Idukki	-	-	-45.17	-31.61.	-39.10	-77.16
8	Trissur	10.88	-2.64	-32.88	-20.71	-52.42	-72.67
9	Palakkad	10.00	-13.10	-20.66	-18.52	-18.96	-49.93
10	Malappuram	-	-	-35.10	-55.43	-52.42	-86.24
11	Kozhikkode	26.45	-65.14	-73.46	-44.15	-40.99	-96.08
12	Wayanad	-	-	-	-26.26	-15.03	-37.34
13	Kannur	3.09	-25.53	-73.35	-39.79	-35.13	-92.01
14	Kasaragod	-	-	-	-35.92	-45.50	-65.08
15	State	12.33	-8.37	-30.21	-37.89	-32.58	-69.96

Source :- Computed from (i) Statistics for planning (various issues), Department of Economics and Statistics, Govt. of Kerala, Thiruvananthapuram. (ii) Economic Review (various issues), State Planning Board, Govt. of Kerala, Thiruvananthapuram.

Growth of Rice Cultivation in Kerala

Table 2 shows that rice registered negative growth rate in area, production and productivity during the overall period from 1960-61 to 2009-10 in Kerala. The table also shows that, decade wise, the crop's growth rate was positive only in the case of productivity during the fifty years considered for analysis.

Supply Demand Gap of Rice in Kerala

The conversion of rice lands decreased the supply of rice in Kerala over the years. Table.3 shows that during 1960-61 to 2009-10, the decrease in the rice supply in Kerala was 43.95 percent, showing continuous decrease over the decades since 1970-71.

TABLE. 2. COMPOUND GROWTH RATES OF AREA, PRODUCTION AND PRODUCTIVITY OF RICE IN KERALA IN DIFFERENT PERIODS

Sl. No.	Item	Period I (1960-61 to 1969-70)	Period II (1970-71 to 1979-80)	Period III (1980-81 to 1989-90)	Period IV (1990-91 to 1999-2000)	Period V (2000-01 to 2009-10)	Overall Period (1960-61 to 2009-10)
1	Area	1.284 **	-1.073	-4.077	-5.555	-4.835 *	-2.683
2	Production	1.583	-0.375	-2.612	-4.694 *	-3.062 *	-1.418
3	Productivity	0.353	0.704	1.524	0.910	1.866	-1.245

* - Significant at probability level 0.01

** - Significant at probability level 0.05

***Source*: -** Karunakaran. N (2013), "Growth Trends of Area, Production and Productivity of Crops in Kerala: A Fifty Years Experience", Southern Economist, Vol. 51 No. 17, pp. 35-38.

Table.4 shows the estimated demand for rice in Kerala for different years from 1960-61 to 2009-10. The data reveals the continuous increase in the demand for rice in Kerala over the decades.

TABLE. 3. SUPPLY OF RICE IN KERALA IN DIFFERENT YEARS

(1960-61 to 2009- 10)

Sl. No.	Year	Supply of Rice (in '000 tonnes)
1	1960-61	1067.53
2	1970-71	1298.01
3	1980-81	1271.96
4	1990-91	1086.58
5	2000-01	751.33
6	2009-10	598.34

Source:- (i) Statistics for planning (various issues), Department of Economics and Statistics, Govt. of Kerala, Thiruvananthapuram. (ii) Economic Review (various issues), State Planning Board, Govt. of Kerala, Thiruvananthapuram.

A comparison of the data in Table.3 and 4 clearly reveals that during 1960- 61, Kerala had a shortage of rice about 40.12 percent, increased to 42.28 percent in 1970-71, 52.44 percent in 1980-81,64.17 percent in 1990-91 and 77.37 percent in 2000-01. In 2009-10 the rice shortage in Kerala was 3022.64 thousand tonnes of the total demand (that is, 83.45 percent shortage).

TABLE 4 DEMAND FOR RICE IN KERALA IN DIFFERENT YEARS

(1960-61 to 2009-10)

Sl. No.	Year	Demand for Rice (In '000 tonnes)
1	1960-61	1782.93
2	1970-71	2248.86
3	1980-81	2674.29
4	1990-91	3032.43
5	2000-01	3319.82
6	2009-10	3615.98

TABLE 5 DEMAND AND SUPPLY GAP OF RICE IN KERALA IN DIFFERENT YEARS

(1960-61 to 2009-10)

Sl. No.	Year	Demand and Supply Gap (In'000 tonnes)	Percentage
1	1960-61	-715.40	40.12
2	1970-71	-950.85	42.28
3	1980-81	-1402.34	52.44
4	1990-91	-1945.85	64.17
5	2000-01	-2568.49	77.37
6	2009-10	-3022.64	83.45

Projected Demand for Rice up to 2026 AD

In view of the increasing demand for rice, it is felt that the radical transformation of paddy fields into gardens or orchards of rubber and other crops will accentuate the supply demand gap of rice in the state in the long run. Therefore an attempt has been made to calculate the demand for rice in Kerala up to the year 2026 under different scenarios of growth in income (5 percent to 10 percent). The results of the projected household demand for rice in Kerala are presented in Table.6. It is estimated that the household demand for rice in Kerala in the coming years compared to the existing supply will enlarge the supply demand gap of rice in Kerala in the future years indicating a threat to rice security and revealing further increase in rice production in a sustainable way.

TABLE 6 PROJECTED DEMAND FOR RICE IN KERALA IN THE YEAR 2026

SI. No.	Growth rate (in percent)	Rural (In'000 tonnes)	Urban On'000 tonnes)	Total (In' 000 tonnes)
1	5	4673.28	176l.27	6434.55
2	6	5190.75	1925.16	7115.91
3	7	5762.98	2103.63	7866.61
4	9	7095.05	2509.66	9604.71
5	10	7866.60	2739.95	10606.55

Conclusion

The major food crop rice in Kerala shows negative growth rate in area in all the decades except 1960's and the decline was highest in the fourth period. The decline in area is due to the large scale conversion of area to other crops like coconut and rubber. During the overall period the compound growth rates of area, production and productivity of rice were negative. The production of rice also reached at a negative growth rates in Kerala due to the declining trend of area.

During 1960-61 the shortage of rice was only 40.12 percent of the total demand increased to 83.45 percent in 2009-10. In 2026 the total demand for rice will again increased to 10606.55 thousand tonnes in Kerala. The situation of rice production in the state can be augmented only if policy prescriptions are launched by the government to make the farmers risk bearers. Yield can be improved by adopting better technology involving adequate, efficient, effective right type of inputs. In the paddy sector strict enforcement of various laws relating to land use should be followed by the revenue authorities. Keeping in view the sustainability and ecological problems created by crops like rubber in the form of land degradation, ground water depletion, chemical pollution, etc, there is a need to introduce various strategies for diverting areas from these crops to rice.

Over the 50 years from 1960-61 to 2009-10, the area under rice was at its peak in 1980-81 and then continuous decline set in. Rice lost the maximum area during the period. The substitution of other crops at the cost of rice has far reaching implications for food and price policies. The continuous increases in the price of food grains, particularly rice recently, affect the poor population adversely than before.

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AGRO-ECONOMIC RESEARCH

Economics of Production, Processing and Marketing of Fodder Crops in India *

Backdrop

The livestock sector in India contributes in the range of 30 to 35 percent in total agricultural output. The desired annual growth of agriculture sector can be accomplished only through enhancing overall productivity of the livestock sector. This would require a steady and adequate supply of quality fodder for supporting the livestock population. Having only 4 to 5 percent of total cropping area under fodder cultivation and low productivity of fodder crops has resulted in a severe deficit of green fodder, dry fodder and concentrates. For development of livestock sector, the need of the hour is, therefore, to meet this shortfall of fodder (which is over 55%) by adopting suitable measures for increasing the production of crop residues, green fodder and agricultural by-products. Fodder deficit can mainly be attributed to our limitations in increasing the area under fodder crops, limited availability of good high yielding Fodder varieties, lack of quality seeds of improved hybrids/ varieties, poor quality of dry fodder like paddy/wheat straw, changing crop pattern in favour of cash crops etc. Besides. low priority accorded to investment in fodder production, lack of post-harvest management for surplus fodder. poor management of grazing/pasture lands and inadequate research, extension and manpower support also aggravated the shortfall situation of fodders. The importance of feeds and fodders in dairy farming needs no emphasis. With increase in the pressure on land due to urbanisation and industrialisation and decrease in the area under fodder and food crops coupled with increasing demand for milk and milk products, the dependency of livestock / dairy farmers on external or purchased inputs has also increased and it is putting pressure especially on the resource poor dairy farmers. Efforts are being made and underway for reducing the gap between the requirement and availability of feeds and fodders through technological interventions to increase the yields, bringing more area under fodder crops, conservation of feeds and fodders, improving the nutritive value of the poor quality roughages, formulation or balanced rations, feeding of unconventional feeds etc. But "fodder scarcity" continued and it has becomes a challenging issue in most of the developing countries including India, where dairying is largely the avocation of the poor, especially women.

Objectives of the study

The study will be carried out to accomplish the following objectives:

1. To study the status of fodder crops cultivated in the selected states;

2. To estimate the costs of production and returns associated with the cultivation of important fodder crops;

3. To identify the processing and marketing system and to estimate the costs and returns at each link for these fodder crops;

4. To study the problems faced by the producers in production, marketing and processing or these fodder crops.

Methodology

The study was conducted in the Gujarat, Madhya Pradesh, Karnataka and Punjab states of India. Important fodder crops in the India include berseem, sorghum, guar, maize, cowpea, oats, chari. bajra. moth, lucerne, jowar etc. In the present study, one most important fodder crop each in the kharif, rabi and summer seasons of the selected states were selected for the in depth analysis. Amongst different districts of each state, three districts with the highest area of fodder in the state were selected purposively. Amongst the selected districts, two blocks from each district, one block near and one distant to the periphery of district headquarter were selected randomly to realise the effect of distance factor in the findings. From each block, a cluster of 3 to 5 villages were randomly chosen. Finally, a sample of 25 farmers was selected randomly from each selected cluster, making a total sample of 150 households. The primary data pertaining to the year 2008-09 was collected by the personal interview method. Though, fodders

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processing practices were not commonly found in India, yet hay/silage method of fodder processing was used by a few farmers. A sample of processors associated with the processing were randomly chosen from the selected blocks to know the different stages of the fodder processing and to assess the costs involved at each stage.

Status of Livestock Population

The size of Live Stock herd in Gujarat increased from 196.7 lakh in 1992 to 237.9 lakh in 2007 indicating spectacular average annual growth rate (AAGR) of 1.28 percent during period 1992-2007. Similarly, the livestock population in Madhya Pradesh showed increasing trend over the years and the total livestock population was found to be increased with the annual growth of 1.90 per cent in the year 2007 as compare to the year 1992 (32400.06 thousand). Likewise. the total livestock population in the state of Karnataka has increased from 29.57 million in 1992 to 30.86 million in 2007 with compound annual growth rate (CAGR) of 0.29 per cent. On the contrary, the livestock population in Punjab has been decreasing continuously since 1990 showed tremendous decline from about 97 lakh in 1990 to only 71 lakh during 2007, at the rate of 1.5 per cent per annum. In Gujarat, the district-wise data on livestock population for period 1997-2007 increased remarkably for Anand, Gandhinagar, Banaskantha, Sabarkantha. Panchmahals, Surendranagar, Kheda, Anand and Valsad districts. In most of the districts of M.P. the growth of total livestock was also found to be increased over the period of time but these annual growth was found to be less than the Madhya Pradesh. In Karnataka, Belgaum, Gulbarga, Tumkur Bagalkot, Davanagere and Koppal were the important livestock rearing districts of state which accounted for 9.72 per cent, 8.21 per cent, 7.89 per cent, 5.47 per cent, 3.61 per cent and 3.38 per cent, of the total livestock population, respectively. The CAGR was high in Koppal and Bagalko and the other districts that showed positive growth in livestock population were Belgaurn. Bellary, Chitradurga, Davanagere, Gadag, Gulbarga and Tumkur. Sangrur and Amritsar are the leading districts in terms of total livestock population in Punjab as their share in total livestock population was about 12 per cent each in 2007. All the districts in the state showed declining trends in total livestock population except in Faridkot.

The cattle population of Gujarat, which stood at 67.50 lakh in 1997 increased to 79.77 lakh in 2007 with an average annual growth rate of 1.68 percent. In terms of cattle population (2007), selected Banaskantha, Sabarkantha and Panchmahals districts occupied first three ranks. AAGR for cattle during period 1997-2007 found positive for all districts except for three districts namely Bharuch, Dahod and Patan. The number of cattle found to be increased over the period of time with an annual growth rate of 0.56 per cent in Madhya Pradesh. Amongst the different districts of Madhya Pradesh, the highest population of cattle found to be annually increased in Shahdol (2.50 %) district followed by Mandla (2.30%), Damoh (2.13%), and Rajgarh (2.01 %). in Karnataka. among districts, Gulbarga has the largest cattle population followed by Hassan, Mysore and Belgaum. All the districts except Bagalkot (1.17 per cent) and Davanagere (0.39 per cent) have showed decline in cattle population. The cattle population in Punjab has declined from about 28 lakh in 1990 to about 17 lakh during 2007, decreasing at the rate of 2.29 per cent per annum. Ferozpur and Amritsar are the leading districts in terms of cattle population in the state as their share in total cattle population was about 11 per cent each in 2007. All the districts in the state showed declining trends in cattle population. The growth of buffaloes was sharp and positive in all the districts (except Navsari) of Gujarat during 1997-2007. Overall, the buffalo population in the state increased at the average annual growth rate of 3.39 percent during 1997- 2007. The population of buffalo showed increasing trend over the years in Madhya Pradesh. All the districts of Madhya Pradesh showed positive average annual growth rates during the period under study. Seven districts of Karnataka have recorded positive growth in its population between 1992 and 2007. In terms of per cent distribution of buffaloes, Belgaum accounted for the highest share of 20 per cent followed by Bagalkot and Tumkur in 2007. The buffalo population in Punjab has declined from about 56 lakh in 1990 to 49 lakh during 2007, falling at the rate of 0.69 per cent per annum. Sangrur and Amritsar are the leading districts in terms of buffalo population in the state as their share in total population was about 14 and 13 per cent respectively in 2007. Most of the districts in the state showed decrease in buffalo population, except the districts of Ropar, Bathinda and Sangrur.

In Gujarat, growth of Horses and Ponies during 1997-2007 had been found negative (- 0.69 %) and only Banaskantha district showed positive growth rates. Likewise, the population of horse and pony were found to be decreased with an average annual growth of (- 4.09 %/ year) over the time in Madhya Pradesh. Drastic reduction in the population over the period of time was observed in all the district of Madhya Pradesh except in Sehore district. In Punjab also their population has declined from about

33 thousand in 1990 to about 27 thousand during 2007, decreasing at the rate of 0.99 per cent per annum. Gurdaspur and Amritsar are the leading districts in terms of population of horses, ponies and donkeys in the state as their share in total population was about 14 per cent each in 2007. The growth of sheep population in Gujarat is negative (-0.75 percent) during period 1997 to 2007 and only Ahmedabad, Anand, Patan, Sabarkantha and Panchmahals districts recorded the positive AAGR whereas in remaining districts growth in sheep population found either negative or stagnant. The population of sheep also shows decreasing trend over the period of time in all the districts of Madhya Pradesh except Jhabua, Betul, Rajgarh. In Karnataka, among the districts, Tumkur accounted for the highest share of sheep population with 11.2 per cent followed by Belgaum and Kolar. Although Tumkur and Kolar accounted for relatively a high concentration of sheep in 1992, their share per cent share has almost declined in the subsequent census periods. In Punjab, the population of sheep has been reduced almost to one third in 2007, as compared to their population of about 5 lakh in 1990). More than 54 per cent of total population of sheep in the state belongs to Ferozpur and Bathinda districts. All the districts in the state showed decrease with regard to sheep population except Ropar district. In Gujarat, the goat population increased from 43.85 lakh in 1997 to 46.40 lakh in 2007 increasing at an average annual growth rate of 0.57 per cent during period. Out of 25 districts, goat population declined in 11 districts. The number of goats was found to be increased in all the districts of Madhya Pradesh except Indore. The highest and maximum average annual growth of goat population was found to be in Mandla district (47.19 %) followed by Datia (7.48 %) and Tikamgarh (7.34%). In Karnataka, large number of goats is present in Gulbarga, which recorded the CAGR of 2.64 per cent between 1992 and 2007. Although goat population in Belgaum declined marginally, it constituted the. second largest populated district followed by Tumkur and Bijapur. In Punjab, the population of goat got reduced almost to half in 2007, as compared to their large population of about 5.38 lakh in 1990. More than 24 per cent of total population of goats in the state belongs to Ferozpur and Bathinda districts. All the districts in the state showed decrease in goat population. the camel population in Gujarat recorded alarming decrease from 65 thousands in 1997 to only 38 thousand in 2007 at AAGR (-5.28 %). The AAGR of camel population in various districts of the state found either highly negative or stagnant. The population of camel was also found to be decreased over the period of time in Madhya Pradesh with an annual growth rate of (-4.20 %). The population of camel is decreasing sharply in Punjab and reached to the lowest ebb of about 1.4 thousand in 2007, as compared to their population of about 43.4 thousand in 1990. Bathinda district housed about 72 per cent of total population of camel in the state. Overtime, all the districts in the state showed decrease in camel population.

Status of Fodder Crops Cultivation

Fodder cultivation is still found to be in a nascent stage in Madhya Pradesh. Out of the total fodder area (0.74 lakh ha), the cultivators of Madhya Pradesh devoted their maximum area under the cultivation of bajra (20%) followed by Jowar (4%), Berseem (2%) and Maize (l %). The area of fodder was found to be declined over the years from 974888 ha. (1990-94) to 745285 (2006-09) in Madhya Pradesh during the last 20 years. The area of Jowar, Berseem, Loosarn, Jai were found to be increased over the year 1990-94, while the area under guar and other fodder decreased in Madhya Pradesh. Among the different fodder crops the highest growth of fodder was observed in the area of loosarn (4.98%/year) followed by berseem (3.89%/year), jowar (2.79%/year), jai (2.39%/year) and maize (1.99%/year) during the last 20 years in Madhya Pradesh. In Punjab, on an average, about 5.83 lakh hectare area is under fodder crops during the period 2005-09, which comes out to be about 7 per cent of gross cropped area of the state. The area under fodder crops was found to decrease continuously from the average area of 7.8 lakh hectare during the period 1990-94. The fodder crops occupied about 2.64 lakh hectare area in the kharif season and about 2.97 lakh hectare during the rabi season. Maize fodder was also cutivated during the summer season covering about 21 thousand hectare area during the season. Sorghum, bajra and guara were the important kharif fodders covering about 24, 14 and 3 per cent of the total area under fodder cultivation in the state during the period 2005-09. Berseem and oats were the important rabi fodders covering about 34 and 12 per cent of the total area under total fodder cultivation in the state. Maize fodder is also cutivated during the summer season covering about 4 per cent of the total area under fodder cultivation in the state during the period 2005-09. During the period 1990-91 to 2008-09, most of the fodder crops showed decrease in area except guara during kharif season and oats during rabi season.

During kharif season, maize fodder showed the highest decrease in area (-11.74 per cent per annum) during the period 1990- 91 to 2008-09, while during rabi season, berseem showed the highest decrease in area (-2 per cent per annum) during the same period. Maize fodder recorded increase in area during the recent years (2000-01 to 2008-09).

Maize fodder is the important fodder crop cultivated during the kharif season in Madhya Pradesh. The cultivation of maize fodder is concentrated only in Khargone (33%), Dhar (22%), Ujjain (16%), Dewas (12%), Hoshangabad (8%), Morena (6%), Mandsur (1%) and Khandwa (1%) districts of Madhya Pradesh. The area of maize is found to be increased by 14.35 per cent (2006-09) as compared to 1990-04 (55.32ha.) with an annual growth of 1.99 per cent per year during the last 20 years (period III). The growth of maize was found to be more in period II (l. 71 %/year) as compared to period I (-2.01 %/year). Sorghum is the important fodder crop cultivated during the kharif season in Punjab. The area under the crop was found to contract continuously and declined to 1.37 lakh hectares in the period 2005-09 from about 2.34 lakh hectares during the 1990-94. Patiala and Sangrur are the leading districts in terms of area under sorghum cultivation in the state as their share was about 16 and 13 per cent of the total area under sorghum cultivation respectively in the period 2005-09. During the periods, 2000-01 to 2008-09 (Period II) and 1990-91 to 2008-09 (Period Ill), all the districts showed the decrease in fodder area. Berseem is the most important fodder crop cultivated during the rabi season in Madhya Pradesh as well as Punjab. The area of Berseem was mainly concentrated in Shajapur, Hoshangabad, Sehore, Ujjain, Ratlam, Bhopal, Shivpuri, Indore, Bhind, Mandsaur, Dhar Morena, Narsinghpur, Betul and Jabalpur districts of Madhya Pradesh. The area of Berseern is increased by 45.76 per cent in the year 2005-09 (20305 hectares) as compared to the year 1990- 94 (13930 hectares). As regards to the growth of berseem is concerned in different district of Madhya Pradesh it is found that the area of berseem is increased with an annual growth rate or 2.82 per cent /year during the last 20 years. The growth of area of berseem was found to be more in period II (2.24%/ year) as compared to period I (-5.54%/year) in Madhya Pradesh. In Punjab, the area under berseem was found to decrease continuously to average of about 1.95 lakh hectares during the period 2005-09 as compared to the average of about 2.55 lakh hectares during the period 1990-94. Amritsar and Sangrur are the leading districts in terms of area under berseem cultivation in the state as their share was about 15 and 13 per cent of the total area under berseem cultivation respectively in the period 2005-09. During the period, 1990-91 to 2008-09 (Period III), all the districts showed the decrease in area, except Hoshiarpur district. Jowar is the most important green fodder crop in Madhya Pradesh during summer season. The jowar cultivation as a fodder is concentrated in Indore, Khargone and Dhar districts of Madhya Pradesh. The area of Jowar was found to be decreased to 37785 hectares (2006-09) from 43338 hectares (1990-94) in Madhya Pradesh with a rate of -1.10 per cent per year during the last 20 years. The growth of area of Jowar was found to be more in period I (3.50%/year) as compared to period II (-1.55%/year). Maize fodder is the most important green fodder available to the livestock in Punjab during summer season. Although, the area under the crop was found to decrease overtime from average of about 21 thousand hectares during 1990-94 to about 17 thousand hectares during 2000-04, but again has shown an increase during recent years (2005- 09) when the area has reached to the average of about 21 thousand hectares. Faridkot and Arnritsar are the leading districts in terms of area under its cultivation in the state as their share was about 26 and 22 per cent of the total area under maize fodder cultivation respectively in the period 2005-09. During the period, 1990-91 to 2008-09 (period Ill), Hoshiarpur district showed the highest significant increase in area (21.3 per cent per annum), while Ferozepur district showed the highest significant decrease in area (-34.78 per cent per annum) during this period.

Socio economic characteristics of fodder growers

Majority of households in each selected state had family members between 4 and 8. Most of the sample households had young head with age above 30 years except in Karnataka where about 46 percent of sample households had head of age up to 30 years. Heads of about 82 percent sample households were literate in Gujarat and karnataka. Illiteracy was found to be significantly higher among the Madhya Pradesh farmers i.e. 52 percent. Majority of farmers of the selected states have net annual income below Rs.l lakh, except in Punjab, where most of the sample households (about 55%) were having annual income of more than Rs. five lakh. Average land holding was the highest for Madhya Pradesh farmers (6.19 hect.) and the least for Karnataka farmers (3.14 hect.). In Gujarat, 82.23

percent of operational land was irrigated. In Madhya Pradesh and Punjab, almost all fodder growers had irrigation facilities at their farms. Madhya Pradesh farmers own the highest i.e. Rs.3.97 lakh worth of farm building and machinery where as it was the least for Punjab farmers (3.08 lakh). In Gujarat nearly 99 percent of the total livestock's were bovines and about 86 percent of the total adult cows in milk were crossbred. The value of total livestock per sample household was found to be Rs.l, 73,608. In Madhya Pradesh, the total respondents 150 fodder growers had found to be reared 63 adult female in milk, 49 adult female in dry, 111 adult male, 26 and 37 respectively of male and female young stock of indigenous cattle at their farm. As regards to buffaloes are concerned, they found to be reared 132 adult female in milk, 63 adult female in dry, 65 young stock male and 68 young stock female. The present value of indigenous cows cross breed cows and buffalo were found to be Rs. 0.10 lacs, Rs. 0.20 lacs and Rs. 0.23 lacs respectively in the area under study. In Karnataka, among indigenous cattle, for overall sample farmers the average price per female dry was the highest with Rs. 18,857 followed by female in milk (Rs. 16,576) and female not calved (Rs. 16,500). Similarly for crossbred cattle the average price for female in milk was the highest (Rs. 21,835) followed by female dry (Rs. 13,750) and male (Rs. 12,857). In Punjab, the average sample household was found to rear about 6 buffaloes and about 2 cattle on the farm (Table I).

In Gujarat, of the total cropped area (GCA), sample farmers devoted 21.93 percent area to pure fodder crops (green fodder) such as lucerne, maize, bajra, sorghum (jowar) and grass. In kharif, of the net cropped area, 21.91 percent devoted to pure fodder crops. It was 17.83 percent in rabi and 36.34 percent in summer. In Madhya Pradesh, the majority fodder growers of the study area adopted Soybean based cropping pattern at their farm. Maize (5.46%) was found to be major fodder crop of the Kharif season, while Berseem (5.25%) and Jowar (5.25%) were found to be major Rabi and summer crop of the study area respectively. In Karnataka, the overall cropping pattern is dominated by coarse cereals accounting for over one-third of the gross cropped area. Among crops, area under maize constituted the highest share of about 21 per cent. The next predominant crop was paddy (18 per cent) followed by sugarcane (11 per cent). Interestingly, napier grass has accounted for about 4 per cent of the gross cropped area of overall sample farmers. In Punjab, paddy and wheat were the major kharif and rabi crops in the study area grown on about 70 and 83 per cent area respectively. Fodder is grown in the kharif, rabi and summer seasons in the state. During kharif season, sorghum, bajra and maize are the important fodder crops and the net cropped area under these crops was about 7, 3 and one per cent respectively. During rabi season, berseem and oat are the important fodder crops and the net cropped area under these crops was about 8 and one per cent respectively. Maize was the summer fodder crop grown on about 6 per cent of the net cropped area. Table 2 showed that in Gujarat as compared to 10 years before i.e.1998-99, majority sample farmers reported marginal increase in area under bajra, maize, paddy and wheat in year 2008-09. However, as compared to base year 1998-99, area under guar seed and cow-pea declined in 2008-09. During same period, area under lucerne showed somewhat increase whereas due to crop diversification, area under summer bajra showed marginal decline. Table 3 showed that the majority sample farmers reported increase in production of fodder from lucerne, sorghum, maize, bajra, paddy and wheat crops. However, they reported decline in production of fodder from cowpea and guar crops. The majority sample households reported improvement in fodder yield for lucerne, wheat, bajra, maize and sorghum in 2008-09 compared to it in 1998-99 (Table 4). In Madhya Pradesh, the 70 per cent of fodder growers reported that their area under fodder was remained same as compared to last 10 years. The above 48 per cent of fodder growers of different size of farms reported that the production under fodder was increased as compared to last 10 years, while about 40 percent of fodder growers reported that they harvested same produce as they harvested 10 year before. The majority of fodder growers (above 80 %) reported that the productivity of fodder was increased as compared to last 10 years. In Karnataka, a large percentage of sample farmers (60 per cent) have reported stagnation of area under napier and jowar. Majority of the farmers reported increase in trend in the production of green fodder from napier during the last 10 years. At the same time, over one-third of them have reported decrease in the production of Napier, which is mainly due to decrease in yield. In Punjab, during the last 10 years, bajra was replaced by sorghum, whereas there was only a marginal increase in area under maize only by a few farmers. A large number of farmers increased the area under maize fodder during the summer season and the crop was found to become more popular amongst the sample households during last 10 years.

TABLE 1 LIVESTOCK POPULATION, SAMPLE HOUSEHOLDS, SELECTED STATES, INDIA, 2008-09
(Per household)

Particulars	Gujarat		Madhya Pradesh		Karnataka		Punjab	
	No.	PV	No.	PV	No.	PV	No.	PV
Indigenous cattle								
Adult female in milk	0.37	0.10	0.42	0.10	1.44	0.16	0.01	0.01
Adult female in dry	0.05	0.01	0.32	0.03	1.59	0.18	-	-
Adult Male	0.87	0.13	0.74	0.13	1.98	0.13	0.17	0.01
Young stock (male)	0.05	0.01	0.17	0.01	1.50	0.08	-	-
Young stock (female)	0.16	0.01	0.25	0.03	1.39	0.07	-	-
Crossbred cattle								
Adult female in milk	2.31	0.58	0.03	0.20	1.48	0.21	1.20	0.29
Adult female in dry	0.47	0.06	-	0.00	1.33	0.1:3	0.21	0.04
Adult Male	0.07	0.01	-	0.00	2.00	0.12	0.11	0.01
Young stock (male)	0.23	0.01	-	0.00	1.50	0.11	0.31	0.01
Young stock (female)	1.23	0.05	0.03	0.08	1.42	0.07	0.57	0.02
Buffalo								
Adult female in milk	1.92	0.56	0.88	0.23	1.59	0.16	3.21	0.76
Adult female in dry	0.84	0.15	0.42	0.15	1.38	0.12	0.87	0.14
Adult male	0.01	0.00	0.04	0.08	1.64	0.08	0.04	0.01
Young stock (male)	0.32	0.01	0.43	0.02	1.17	0.01	0.83	0.02
Young stock (female)	1.58	0.05	0.45	0.04	1.79	0.03	1.35	0.05
Sheep								
Male		-		0.00	2.00	0.04	-	-
Female		-		0.00	1. 78	0.04	-	-
Young stock		-		0.00	1.67	0.01		
Goat								
Male	0.01	-	0.52	0.02	2.33	0.03	-	-
Female	0.03	-	0.69	0.01	2.75	0.02	-	-
Young stock		-	0.63	0.01	1.00	0.01	-	-
Pig								
Male	-	-	-	0.00	2.00	0.07	-	-
Female	-	-	-	0.00	1.00	0.02	-	-
Young stock	-	-	-	0.00		0.08	-	-
Camel								
Male	-	-	-	-	-	0.03	-	-
Female	-	-	-	-				
Young stock	-	-	-	-	-	0.04	-	-

NOTE: PV is the Present value (Rs.in lacs).

TABLE 2 STATUS OF AREA FODDER CROPS DURING LAST 10 YEARS, SAMPLE HOUSEHOLDS, SELECTED STATES, INDIA, 2008-09

(Per cent farmers reported)

Crops	Gujarat			Madhya Pradesh			Karnataka			Punjab		
	I	D	S	I	D	S	I	D	S	I	D	S
Kharif crops												
Jowar							3.14	2.52	94.34			
Maize	56.76	8.11	35.14	8.67	16.00	75.33				3.00	-	3.00
Sorghum	55.36	14.29	30.36							16.00	21.00	45.00
Bajra	46.46	20.20	33.33							1.00	15.00	35.00
Guar	34.69	36.73	28.57									
Paddy	59.26	3.70	37.04									
Cowpea	55.17	l0.34	34.48									
Green grass	65.63	15.63	18.75									
Others	35.29	7.84	56.86									
Rabi crops												
Berseem				12.00	18.33	70.00				9.00	11.00	45.00
Lucerne	36.13	15.13	48.74	-	-	40.00						
Wheat	51.04	15.63	33.33									
Maize	72.73	-	27.27									
Sorghum	56.00	4.00	40.00									
Oats										3.00	1.00	11.00
Others	31.25	18.75	50.00									
Summer crops												
Jowar				24.40	10.67	65.33						
Maize	67.57	16.22	16.22							19.00	-	9.00
Bajra	31.48	17.59	50.93									
Cowpca	14.29	42.86	42.86									
Others	-	-	100.00									
Perennial crop												
Napier							29.86	10.42	59.72			

NOTE: 1 Indicates Increased; D indicates decreased and S indicates Remained same.

TABLE 3 STATUS OF PRODUCTION OF FODDER CROPS DURING LAST 10 YEARS, SAMPLE HOUSEHOLDS, SELECTED STATES, INDIA, 2008-09

(Per cent farmers reported)

Crops	Gujarat			Madhya Pradesh			Karnataka			Punjab		
	I	D	S	I	D	S	I	D	S	I	D	S
Kharif crops												
Jowar							16.67	55.56	27.78			
Maize	71.62	9.46	18.92	48.00	9.00	43.00				6.00	-	1.00
Sorghum	60.71	14.29	25.00							28.00	1.00	34.00
Bajra	48.48	20.20	31.31							9.00	15.00	28.00
Guar	36.73	36.73	26.53									
Paddy	68.52	5.56	25.93									
Cowpea	55.17	l3.79	31.03									
Green grass	65.63	15.63	18.75									
Others	41.18	11.76	47.06									
Rabi crops												
Berseem				49.00	10.33	40.67				9.00	1.00	81.00
Lucerne	38.66	13.45	47.90	-	-	40.00						
Wheat	55.21	17.71	27.08									
Maize	81.82	-	18.18									
Sorghum	60.00	4.00	36.00									
Oats										5.00	1.00	10.00
Others	37.50	21.88	40.63									
Summer crops												
Jowar				54.53	7.00	38.47						
Maize	67.57	16.22	16.22							19.00	-	9.00
Bajra	36.11	17.59	46.30									
Cowpca	14.29	42.86	42.86									
Others	-	100.00	100.00									
Perennial crop												
Napier							51.79	37.50	10.71			

NOTE: Indicates Increased; D indicates decreased and S indicates Remained same.

TABLE 4 STATUS OF YIELD OF FODDER CROPS DURING LAST 10 YEARS, SAMPLE HOUSEHOLDS, SELECTED STATES, INDIA, 2008-09

(Per cent farmers reported)

Crops	Gujarat			Madhya Pradesh			Karnataka			Punjab		
	I	D	S	I	D	S	I	D	S	I	D	S
Kharif crops												
Jowar							16.67	55.56	27.78			
Maize	71.62	9.46	18.92	87.33	2.00	10.67				6.00	-	1.00
Sorghum	60.00	14.55	25.45							29.00	-	34.00
Bajra	48.48	19.19	32.32							10.00	8.00	33.00
Guar	38.78	34.69	26.53									
Paddy	70.37	5.56	24.07									
Cowpea	55.17	17.24	27.59									
Green grass	65.63	18.75	15.63									
Others	41.18	11.76	47.06									
Rabi crops												
Berseem				86.00	2.67	11.34				33.00	-	35.00
Lucerne	37.82	13.45	48.74	-	-	40.00						
Wheat	55.21	17.71	27.08									
Maize	79.55	-	20.45									
Sorghum	56.00	4.00	40.00									
Oats										5.00	1.00	9.00
Others	37.50	21.88	40.63									
Slimmer crops												
Jowar				84.67	3.33	12.00						
Maize	67.57	16.22	16.22							25.00	1.00	2.00
Bajra	35.19	18.52	46.30									
Cowpea	14.29	50.00	35.71									
Others	-	100.00	-									
Perennial crop												
Napier							51.79	37.50	10.71			

NOTE: Indicates Increased; D indicates decreased and S indicates Remained same.

In Gujarat, 50.70 per cent of farmers reported that the population of bullock remained almost same in the reference year (2008-09) as compared to the base year (1998-1999). On the contrary, 53.21 per cent sample farmers reported an increase in the population of the cow. Further, increase in number of female buffaloes, was reported by 34.03 per cent sample households. In Madhya Pradesh, the population of cattles and male buffaloe were found to be decreased as compared to last 10 years while the population of female buffalo and goat was respectively increased and remain same in the area under study. In Karnataka, over 80 per cent of the farmers reporting either decrease or stagnation in the population of cattle female and male in the last one decade. There is a marginal increase in buffalo female population. But, about 47 per cent of the sample farmers reported decrease in goat population, while 43 per cent reported increase in sheep population. In Punjab, during the last 10 years period, about 13 per cent of the dairy farmers observed the increase in buffalo population, which was higher than about 7 per cent of the dairy farmers for cattle population. More number of dairy farmers observed increase in buffalo population and decrease in cattle population during the last 10 years period. Majority of sample households in Gujarat reported improvement in the milk yield and production of both, cows and buffaloes in the reference year (2008-09) as compared to the base year (1998- 1999). About 54.13 per cent of cattle farmers and 39.58 percent of the buffalo farmers reported increase in the milk yield and production. About 29.36 per cent of cow farmers and 31.25 per cent of buffalo farmers reported more or less no change in the milk yield and production. In Madhya Pradesh, more than 90% of fodder growers reported that the milk yield of female cattle (cows) decreases as compared to 10 years before in the area under study, while the milk yield of buffaloes was found to be increased. The more than the 70% of fodder growers reported that the goat meat yield was remained same as compared to 10 years before. In Karnataka, while a quarter of farmers reported increase in buffalo milk yield, but about one-third have reported stagnation and two-fifth have reported decrease during the last 10 years. Similarly, about 45 per cent and 33 per cent of farmer reported stagnation and decrease in milk yield from cattle, respectively. As far as meat yield is concerned, large percentage of sample farmers reported increase in meat production from goat, sheep, pig and poultry. In Punjab, during the last 10 years period, about 45 per cent of the dairy farmers observed the increase in buffalo milk productivity, which was higher than the productivity of cattle milk which was revealed by about 29 per cent of the dairy farmers. More number of dairy farmers observed increase in buffalo milk productivity as compared to in cattle milk productivity during the last 10 years period.

Table 5 showed that the most popular practice of feeding livestock in Gujarat is a combination of both, stall feeding and grazing. Among the indigenous cow owners, 59.04 percent opted for open grazing in the morning and stall feeding to animals in the evening. About 39.76 per cent indigenous cow owners reported stall feeding to animals during the entire year. About 75.28 per cent crossbreed cow owners adhere to only stall feeding whereas 24.72 per cent followed combination of both, stall feeding and open grazing. In case of buffaloes, about 66.41 per cent farmers followed only stall feeding and 33.59 per cent farmers followed combination of both, stall feeding and grazing. In Madhya Pradesh, more than 60 per cent of fodder growers reported that they adopted stall feeding for the cattles and buffaloes instead of grazing. In Punjab, the practice of stall feeding as well as grazing was prevalent in the study area as the sample respondents were rearing only cattle and buffaloes on their farms. The practice of grazing was more prevalent among the cattle as compared to buffalo growers. Amongst cattle, the practice of grazing was more popular for indigenous cattle as compared to cross bred cattle. In Gujarat, in all seasons, total quantity of feed and fodder fed to dry bovines was lower than quantity given to in milk bovines of same category. Across the seasons, total quantity of feed and fodder fed to different categories of livestock was highest in winter season and lowest in summer season. Bullocks were fed more dry fodder and less green fodder in all the seasons. Grains and concentrates given to in milk bovines was higher than its quantity fed to dry animals. As compared to crossbreed cows, quantity of feed and fodder fed to indigenous cows was lower. In Madhya Pradesh, an average fodder growers feed an indigenous cow with 12.86 kg. maize fodder, 2.66 kg. of wheat straw and 1.58 kg. oilcake/ day in the rainy season while they fed 12.30 kg. berseem, 1.19 kg. soybean straw and 1.88 kg. oil cake/ day in the winter season. In the summer season they feed their indigenous cow with 7.36 kg. of jowar 1.49 kg. of wheat straw and 1.99 kg. of oil/day cake. The difference of 2 kg. + was observed in case of cross breed and buffaloes' in milk, while absence of oil cake and chuni was observed in case of dry animals. In Karnataka, the average consumption rate of green fodder was higher during kharif than the rates observed in rabi and summer seasons. The consumption of dry fodder was observed relatively high during rabi and summer. Among livestock types, the average consumption rate of green fodder per animal was worked out to be higher for crossbred cattle in milk across the seasons. In fact, the consumption of green fodder by crossbred cattle in milk was 17.5 Kg./day, 16.4 Kg./day and 13.9 Kg./day in kharif, rabi and summer, respectively. In Punjab, during all the seasons, the in milk animals were found to feed more green fodder as compared to dry/male

animals. Amongst in milk animals, the cross bred animals were found to fed higher doses of green fodder as compared to buffaloes. Amongst all the seasons, the animals were fed the least doses of green fodder on per day basis in the summer season. The grains and concentrates were found to be fed mostly to the in milk animals and young stock.

Economics of Production of Fodder Crops

In Gujarat, average cost of cultivation per hectare for kharif maize (cereal) comes to Rs. 15107. Human labour (32.70 %), machine labour (20.20%), FYM (14.80 %) and chemical fertiliser (14.80 %) were the major contributors in the total cost of cultivation. In Madhya Pradesh, the total cost of cultivation of maize fodder was Rs. 9264.64 /ha in the cultivation of maize. The Farm Yard Manure (37%), Machine labor (16%), Seed (13%), Chemical fertilizer (12%), Hired human Labour (10%) and Family Labour (7%) were found to be major components of cost of cultivation of maize in the area under study. Jowar is an important food/ fodder crop in Karnataka. The overall estimated variable cost was Rs. 223/ha. Family labour has accounted for the highest proportion of total cost. In Punjab, the total variable cost on per hectare basis far the most important fodder crop during kharif season (sorghum crop) was found to be Rs. 11946. Amongst variable cost components, the share of human labour was more than 71 per cent. The total cost of cultivation per hectare for lucerne, being the most important forage crop of Gujarat during rabi season was Rs.31372. The item-wise examination of cost shows that in total cost of cultivation, share of seed cost was highest at 33.80 per cent. In Madhya Pradesh, berseem is found to be a major fodder crop cultivated by the majority of fodder growers in the winter season and an average fodder grower invested Rs. 13835.66 /ha in the cultivation of berseem. The Farm Yard Manure (33%), Seed (26%), Machine labor (11%), Irrigation (9%), Chemical fertilizer (8%), Hired human Labour (7%) and Family Labour (4%) were found to be main component of cost of cultivation of berseem the area under study. In Punjab, the total variable cost on per hectare basis for the most important fodder crop during rabi season (berseem) was found to be Rs. 18231. Human labour was found to take larger proportion of the cost as its share was about 66 per cent. In Gujarat, the total cost of cultivation per hectare for lucerne (summer) was Rs. 25075. The item-wise examination of cost data shows that in total cost of cultivation, share of seed cost was highest at 34.6 per cent. In Madhya Pradesh, jowar is found to be a major fodder crop cultivated by the majority of fodder growers in the summer season and an average fodder grower invested Rs. 9264.64 ha in the cultivation of jowar. The Farm Yard Manure (32%), Machine labor (16%), Seed (11%), Hired human Labour (11 %), Chemical fertilizer (10%), Irrigation (9%), and Family Labour (8%) were found to be main components of cost of cultivation of maize the area under study. In Punjab, the total variable cost on per hectare basis for most important fodder crop during summer season (maize fodder) was found to be Rs. 8948. About 60 per cent of the operational cost was incurred on human labour, most of which is required during the harvesting of the crop.

Table 6 showed that in Gujarat, during kharif season, net return per hectare for maize cereal crop comes to Rs. 32775 which was higher by Rs. l 0821 compared to net return of Rs. 21954 for maize grown as pure green fodder. Paddy is competing crop of maize. Overall, gross value of production (MP+BP) and total variable cost of paddy were Rs. 34375 and Rs. 16444 respectively. Overall, net return per hectare for paddy was Rs. 18291. In rabi season, net return per hectare was Rs. 13828 for lucerne whereas it was Rs. 33922 for competing crop wheat (Table 7). In summer season, net return for study crop lucerne was only Rs. 6569 whereas it was Rs. 16246 for competing crop jowar/sorghum grown as green fodder crop (Table 8). In Madhya Pradesh, there was found no competition of fodder crops with other crops in the area under study. The comparative picture of fodder crops showed that the cultivation of beseem was found be more profitable in the area under study in which an average fodder grower invested Rs.13835.66/ha and received Rs. 52521.47/ha revealed that on the investment of Rs. 1.00, he got Rs. 3.80 as benefit over the variable cost, while he received only Rs. 1.80 and 1.69 on investment of Rs. 1.00 respectively from the cultivation of maize and jowar. He also got maximum net return from the cultivation of berseem (Rs. 52521.47/ha) as compared to cultivation of maize (Rs.16664.92/ha) and jowar (Rs. 16092/ha). The returns over variable cost fetched from paddy on per hectare basis were Rs. 10300 as compared to Rs. 552 for the jowar fodder in Karnataka. Farmers do not allocate higher area under fodder crops due to low profitability in relation to their competing crops. In Punjab, the returns over variable cost fetched from paddy on per hectare basis were more than double as compared to sorghum. Berseem was found to be more remunerative as compared to sorghum but still the returns over variable cost were only 65 per cent as compared to the most important competing crop during the rabi season (wheat). Likewise, during the summer season, maize fodder was found to be less remunerative as compared to most important competing crop during the season i.e. maize grain. The returns over variable cost for maize fodder were only 70 per cent as compared to maize fodder during the season.

TABLE 5 LIVESTOCK FEEDING PRACTICES, SAMPLE HOUSEHOLDS, SELECTED STATES, INDIA, 2008-09

(Percent multiple response)

Season/Crop	Gujarat	Madhya Pradesh	Karnataka	Punjab
1. Indigenous Cattle				
Adults				
Stall feeding	39.76	66.67	NR	100.00
Grazing	1.20	10.00	NR	30.00
Both	59.04	23.33	NR	-
Young stock				
Stall feeding	30.77	87.34	NR	-
Grazing	-	6.00	NR	-
Both	69.23	6.67	NR	-
2. Crossbreed Cattle				
Adults				
Stall feeding	75.28	90.67	NR	100.00
Grazing	-	4.67	NR	6.00
Both	24.72	4.66	NR	-
Young stock				
Stall feeding	59.72	84.67	NR	100.00
Grazing	-	8.00	NR	3.00
Both	40.28	7.33	NR	-
3. Buffalo				
Adults				
Stall feeding	66.41	88.00	NR	100.00
Grazing	-	6.67	NR	4.00
Both	33.59	5.33	NR	-
Young stock				
Stall feeding	51.92	82.67	NR	100.00
Grazing	2.88	10.00	NR	3.00
Both	45.19	7.33	NR	-
4. Goat				
Stall feeding	-	5.33	NR	-
Grazing	-	84.67	NR	-
Both	100.00	10.00	NR	-

Note: NR is Not reported

TABLE 6 ECONOMICS OF KHARIF FODDER CROP VIS-A-VIS COMPETING CROP, SAMPLE HOUSEHOLDS,SELECTED STATES, INDIA, 2008-09

(Rs/ha)

Particulars	Yield (Qtls/ha)	Price (Rs/qtl)	Gross Returns	Total variable costs	Return Over variable costs
Gujarat					
Maize (MP+BP)	NR	NR	48905	16130	32775
Paddy (MP+BP)	NR	NR	34735	16444	18291
Madhya Pradesh					
Maize chari	269.37	96.26	25929	9264	16665
Competing crop	NR	NR	NR	NR	NR
Karnataka					
Jowar	3.9	200	775.1	222.5	552.6
Paddy	15.8	890.0	15774	5474	10300
Punjab					
Sorghum	448	56	25082	11946	13136
Paddy	59	775	45725	15635	30090

NR- is not reported.

TABLE 7 ECONOMICS OF RABI FODDER CROP VIS-A-VIS COMPETING CROP, SAMPLE HOUSEHOLDS, SELECTED STATES, INDIA, 2008-09

(Rs/ha)

Particulars	Yield (Qtls/ha)	Price (Rs/qtl)	Gross Returns	Total variable costs	Return Over variable costs
Gujarat					
Lucerne	397.82	126	50221	36393	13828
Wheat	NR	NR	50079	16158	33922
Madhya Pradesh					
Berseem	649.73	102.13	66357.13	13835.66	52521.47
Competing crop	NR	NR	NR	NR	NR
Karnataka	NR	NR	NR	NR	NR
Punjab					
Berseem	855	49	41895	18231	23664
Wheat	47	1080	56635	17129	39506

NR : is not reported.

TABLE 8 ECONOMICS OF SUMMER FODDER CROP VIS-A-VIS COMPETING CROP, SAMPLE HOUSEHOLDS, SELECTED STATES, INDIA, 2008-09

(Rs/ha)

Particulars	Yield (Qtls/ha)	Price (Rs/qtl)	Gross Returns	Total variable costs	Return Over variable costs
Gujarat					
Lucerne	260.24	125	32418	25850	6569
Bajra	190.03	146	27731	18646	9085
Madhya Pradesh					
Jowar chari	253.37	101.03	25597.97	9505.85	16092.12
Competing crop	NR	NR	NR	NR	NR
Karnataka	NR	NR	NR	NR	NR
Punjab					
Maize fodder	361	56	20220	8948	11272
Maize grain	37	725	26825	11285	15540

NR is not reported.

Processing and Marketing System for Fodder Crops

In Gujarat fodder is generally sold by producers through one marketing channel. namely producer-Local Trader-Consumer. In this channel local trader incurred marketing expenses mainly on transportation and loading/unloading of fodder and marketing costs per Qtl. remained around Rs.23 in all the three season. The consumer's price was Rs. 300/Qtl. in khari f and it touched to Rs. 400/Qtl. in summer. The net profit margin of local trader on consumer's price was highest at Rs. 52.31(9.17%) in rabi season and lowest at Rs. 26.67 (8.9 %) in kharif season. In Punjab. in channel I (Producer-Forwarding agent/Commission agent-Dairy owner/Consumer), the produce was directly taken by the producer to the forwarding/commission agent. who were forwarding the produce to the big dairy owners keeping in view the fodder demanded, through the chaff cutters. In channel 11 (Producer-Forwarding agent/ Commission agent-Chaff cutter- Consumer), the chaff cutter purchases the produce from forwarding/commission agent, who charges their commission from the producer as well as buyer. In channel III, the produce is directly disposed of to the consumers in the village itself. In channel-I for the sale of sorghum, the producer's share in consumer's rupee was found to vary from 74 to 77 per cent for the different fodder crops. In channel-Il the producer's share in consumer's rupee was about 65 to 70 per cent for different crops.

In Gujarat, the cost of harvesting, packing, loading, unloading etc. is operational costs for hay making (Table 9). Overall, post harvesting operational costs of processing one quintal fodder was found highest for summer season. It was Rs. 27.34 for Lucerne and. Rs. 27.24 for bajra fodder. Whereas, processing cost was lowest at Rs. 21.42 for wheat in rabi season. It was Rs. 24.32 and Rs. 24.57 for kharif maize fodder and kharif bajra fodder respectively. Among various operational costs, share of harvesting in total cost was more than 50.00 percent. In Punjab, silage or ensilage is a method of preservation of green fodder through fermentation to retard spoiling and this method of processing is more popular as compared to hay making. This is practised during the kharif season when sorghum, bajra and chary are mixed, chaffed and put in the underground pit. The average storage capacity of the pit was found to vary between 1500 quintals for medium size farms to 3000 quintals for large size farms. The storage period was up to one year from the time of storage (July to August). Less than one per cent of the produce was found to be spoiled as the rain water enters from the corners through the sheets used. Regarding the post harvest operational cost involved in for silage making, it was about Rs. Il/q. About 74 per cent of the operational cost has to be incurred during chaffing followed by transportation (18 per cent) and pit making (about 6 per cent).

Problems faced by fodder growers

In Gujarat, inferior quality of seeds of fodder crops, non-availability of adequate quantity of required brand HYV seeds, problems related to insects / pests and plant diseases and the lack of technical knowledge were the major problems in production of fodder crops (Table 10). In Madhya Pradesh, lack of technical know how (76.66%) was found to be the biggest problem observed during the course of investigation and reported by the maximum numbers of respondents in the area under study. The inferior quality of seed (74.00%), faulty input delivery system (74.00%), high expenditure in production due power cuts (74.00%), non availability or skilled labour in time and high cost of labour (68.00%), faulty government policy as distribution of mini kits of fodder seeds from veterinary department instead of agriculture department (52%) were the other major problems found in the study area reported by the majority or the respondents in production of fodder crops. In Karnataka, the highest percentage of farmers reported problems with respect to access to credit, labour availability, high expenditure on production, seed quality and access to technical knowledge. In Punjab, Supply of poor quality and un-recommended varieties of seed, shortage of labour especially during harvesting or the crop. lack the technical knowledge, acquisition of credit were the major problems faced by the fodder growers during production of these crops in the study area.

In Gujarat, as more than 86.00 percent of sample households were not involved with marketing of fodder crops, they are not in position to inform about the problems they raced while marketing of fodder production (Table 11). Therefore, they reported no problem. Few households repotted problems in respect of non-availability of market information in time and transport facility at reasonable rate. In Punjab, Low price in the market. lack of market information and delayed payment for the produce by the commission agents in the market were reported as the major marketing problem confronted by fodder growers of the study area.

TABLE 9 DETAILS REGARDING PROCESSING OF FODDER CROPS, SAMPLE HOUSEHOLDS, SELECTED STATES, INDIA, 2008-09

Particulars	Gujarat		Punjab	
	Kharif fodder	Rabi fodder	Summer fodder	Kharif fodder
(1)	(2)	(3)	(4)	(4)
1. Processing method adopted (% Households)				
Hay making	43.33	5.33	23.33	-
Silage making	-	-	-	3.0
2. Average Storage capacity	NR	NR	NR	2100
3. Average quantity of produce stored (qtls)	57.91	100.63	28.50	1935
4. Percent capacity utilized	NR	NR	NR	92.0
5. Material used for storage (%)				
Sheet	100	100	54.29	3.0
Chemical	24.62	37.50	20.00	1.0
6. Produce lost during storage (%)	14.14	14.18	NR	0.7
7. Post Harvest operational costs (Rs./q)				
Harvesting	9.28	5.65	6.25	-
	(36.4)	(24.1)	(22.9)	-
Packing	3.21	2.61	4.69	-
	(12.6)	(11.1)	(17.1)	
Loading/unloading	2.79	4.78	5.47	
	(11.0)	(20.4)	(20.0)	
Transportation	3.98	5.22	4.38	2.0
	(15.6)	(22.2)	(16.0)	(17.7)
Chaffing	1.18	-	-	8.3

TABLE 9 DETAILS REGARDING PROCESSING OF FODDER CROPS, SAMPLE HOUSEHOLDS, SELECTED STATES, INDIA, 2008-09--Contd.

(1)	(2)	(3)	(4)	(4)
	(4.6)			(73.5)
Pit making	-	-	-	0.7 (6.2)
Storage	2.65 (10.4)	2.61 (I I. I)	3.13 (1 1.4)	-
Chemical used	0.74 (2.9)	0.87 (3.7)	1.56 (5.7)	0.1 (0.9)
Sheet used				0.2 (1.8)
Any other	1.67 (6.5)	1.74 (7.4)	1.88 (6.9)	-
Total	25.50 (100.00)	23.48 (100.00)	27.34 (100.00)	11.3 (100.0)

NOTE: Figures in parentheses show percentage to total cost, NR is Not reported.

TABLE 10 PROBLEMS RELATED TO THE PRODUCTION OF FODDER CROPS, SAMPLE HOUSEHOLDS, SELECTED STATES, INDIA 2008-09

(% multiple response)

Particulars	Gujarat	Madhya Pradesh	Karnataka	Punjab
Kharif fodder				
l. Seed Quality	16.67	74.00	NR	33
2. Input delivery	15.33	74.00	NR	-
3. Expenditure on production	48.00	76.66	NR	-
4. Insect-pests and diseases	30.00	13.33	NR	-
5. Technical knowledge	24.67	74.00	NR	26
6. Access to credit	32.67	27.33	NR	27
7. Availability andcost of labour	40.67	68.00	NR	13
8.Government Policies	-	52.00	NR	-
9. Any other	9.33	-	NR	-
Rabi fodder			NR	
I. Seed Quality	16.00	88.67	NR	38
2. Input delivery	16.00	65.33	NR	-
3. Expenditure on production	47.33	53.33	NR	-
4. Insect-pests and diseases	31.33	10.00	NR	-
5. Technical knowledge	25.33	72.67	NR	27
6. Access to credit	32.00	11.33	NR	29
7. A vailability and cost of labour	40.67	36.66	NR	17
8. Government Polices	-	46.00	NR	-
9. Any other	8.67		NR	-
Summer fodder				
1. Seed Quality	18.00	66.67	NR	31
2. Input delivery	18.00	65.33	NR	-
3. Expenditure on production	48.67	53.33	NR	-
4. Insect-pests and diseases	23.33	11.33	NR	-
5. Technical knowledge	25.33	72.67	NR	30
6. Access to credit	31.33	10.66	NR	27
7. Availability and cost of labour	38.67	39.33	NR	20
8. Government Polices	-	46.00	NR	-
9. Any other	9.33	-	NR	18

NR is not reported.

TABLE 11 PROBLEMS RELATED TO THE MARKETING OF FODDER CROPS, SAMPLE HOUSEHOLDS, SELECTED STATES, INDIA, 2008-09

(% multiple response)

Particulars	Gujarat	Madhya Pradesh	Karnataka	Punjab
Kharif fodder				
1. Market information	1.33	NR	NR	29
2. Output price related problems	0.67	NR	NR	43
3. Packing material	-	NR	NR	-
4. Packaging	-	NR	NR	-
5. Transportation	2.00	NR	NR	-
6. Delay in the payments	-	NR	NR	-
7. Marketing costs	-	NR	NR	-
8. Other storage facilities	-	NR	NR	-
9. Role of intermediaries	-	NR	NR	33
10. Any other	-			
Rabi fodder				
1. Market information	1.33	NR	NR	38
2. Output price related problems	0.67	NR	NR	25
3. Packing material	-	NR	NR	-
4. Packaging	-	NR	NR	-
5. Transportation	2.67	NR	NR	13
6. Delay in the payments	-	NR	NR	-
7. Marketing costs	-	NR	NR	-
8. Other storage facilities	-	NR	NR	-
9. Role of intermediaries	-	NR	NR	-
10. Any other	-			
Summer fodder				
1. Market information	5.33	NR	NR	50
2. Output price related problems	2.00	NR	NR	50
3. Packing material	-	NR	NR	-
4. Packaging	-	NR	NR	-
5. Transportation	3.33	NR	NR	50
6. Delay in the payments	-	NR	NR	-
7. Marketing costs	-	NR	NR	-
8. Other storage facilities	-	NR	NR	10
9. Role of intermediaries	-	NR	NR	-
10. Any other	-	NR	NR	-

N R is not reported.

Policy Implications

In Gujarat, fodder markets being unorganized and unregulated, fodder production become low priority enterprise in potential fodder production areas. Also, dry fodder being mainly by- products from cereal crops, their economics linked with demand and price realisation of main products. In normal year, there were surplus productions of fodder / grass. Hence, organizing fodder banks in these areas is suggested. Fodder / grass from surplus production areas may be stored in these fodder banks in normal years. It is suggested that government must evolve an arrangement to produce HYV seeds for fodder crops in adequate quantity and these should be made available at reasonable rate in adequate quantity to the farmers. There is a need to adopt price mechanism which ensure higher net return from cereal crops and prevent shift in crop pattern from cereal crops to cash crops. Create organised marketing structure in surplus fodder / grass production areas. Also arrange to provide market information uninterruptly to farmers. The production of grass / fodder can be increase by regeneration of wastelands through controlled exploitation and growing grass in a systematic manner. The problematic lands may be treated to make them fit for growing grass. Cultivation of fodder trees on marginal land and degraded forest areas will be helpful in increasing forage production. Also encourage silvi-pasture in waste lands. Government may provide organizational and financial support to individuals for making investment in such treatments. Large producers of fodder / grass should be encouraged to create godown by providing institutional credit at reasonable rate. They should also be provided bank credit for growing fodder. A separate feed and fodder development authority should be established within the Directorate of Animal Husbandry with necessary technical manpower to undertake inter-agency co-ordination in fodder production, fodder seed production, conservation and transportation of fodder. The forest grass should be harvested during monsoon season and converted into hay and packed, compressed and transported to other destinations. This would be helpful in reducing fodder deficit. The state should develop and maintain pasture and fodder patches along water reservoir, canals and rivers. Gram panchayat should be encouraged for development of pasture lands.

In Madhya Pradesh, the fodder cultivation was not shown too much progress in the state since 1990. The cultivator still growing fodder in the line of crop cultivation and the majority of them were not known the recommended package of practices of fodder cultivation. The fodder growers were also found to be not doing fodder preservation techniques viz. hay and silage making for the lean period. They were not cultivating fodder in commercial line as none of them involved in marketing of fodder in the state. Hence, it is the right time that state government re-intensified their efforts in progress of fodder in the state because without introducing dairy based faming system approach on the farmers' farm, their income should not became double, which is the ultimate target of the state government. It is only activity which was done by the farmers since long time. It not only generated income but also enhanced employment at their owned farm. The mini kit of fodder crops were found to be distributed by the animal husbandry department and they were not taking interest in the extension activities concern to the fodder, due to lack of training in it and it lacks the aura of being doctor and the fodder is more inclined towards agriculture. The animal husbandry department in the state is only concerned with the treatment aspect and improvement of breeds because here lays the money. Investing interest in fodder sector will benefit the live stock owners but who cares? Hence, there is urgent need to create the separate department for fodder development separate from animal husbandry department or merge the fodder development sector in agriculture department for better extension activities and distribution of fodder min kits with technical know-how because the cultivation of fodder is more or less similar to the cultivation of crops.

In Karnataka, concerted efforts should be made to encourage the farmers to cultivate green fodder crops for enhancing the quality of livestock rearing across districts in the state. This may be attempted initially by providing subsidised seed material and fertiliser to group of potential farmers at hobli level and then can be replicated to others through these successful farmer groups. It is thus, necessary to conduct farmers' training periodically by the officials of the Department of Agriculture to impart skill and technical knowledge to the farmers. In this regard, a co-ordination between Department of Agriculture and Department of Animal Husbandry and Veterinary Services is necessary for better sharing of technical knowledge including on feeding practices with the farmers. There is huge scope for increasing the yield of napier and jowar through adoption of better technology and field management. For this, good quality seed material and other inputs should be made available. Local institutions should be encouraged to play an active role in protecting the common property resources, which not only will help in the development of livestock enterprises but also in the maintenance of ecological balance. Efforts should be made

to popularise the improved breeds of different livestock which are adaptable to different agro-climatic conditions. Karnataka has relatively a large area under dry land. The livestock species suitable to dry land areas should be promoted so that they perform better in those areas. Efforts should also be made to promote rearing of high quality buffaloes for improving the dairy development. This assumes importance in the context of decline or stagnant cattle population in the state. Availability of reliable data on fodder cultivation will be useful for better planning of livestock development in the state. Concerted efforts should be made by the government departments to systematically collect and publish data on fodder cultivation.

In Punjab, due to heavy pressure of growing wheat and paddy, the area under fodder has been decreasing, and so as the composition of the live-stock population. As. a viable means of diversification, cultivation of fodder should be increased along with· increase in livestock population, in order to make it more productive. Farmers suggested improving the quality of seedlings and frequent checks by the Department officials can help in this direction. More emphasis is needed to evolve the high yielding varieties for various fodder crops as presently these are regarded as lesser important crops. The centre government grant of Rs. 6 crores to the State Government during 2009-10 and 2010-11 for providing subsidies to purchase quality berseem seed to cattle farmers, need to be increased keeping in view the serious problem of non- availability of quality seed for various fodder crops in the state. Further, the state government needs to use such subsidies more effectively for right cause and concern. The primary agricultural credit cooperative societies and other funding agencies should be persuaded to provide adequate short-term credit facilities to cover the operational cost. There is need to make more efforts for effective extension for these hitherto neglected crops so that the farmers may be able to know the latest know how regarding these crops. On the marketing front, most of the fodder growers were in favour of establishment of regulated markets in the region. To stabilize the prices, the farmers were in favour of establishment of better market infrastructure by the government so that the prices may not go down by the certain minimum level and they may come out of the clutches of the commission agents. The state has abundant roughage (wheat and rice crop), which can be used in making silage through processes developed and recommended by Punjab Agricultural University, Ludhiana. The centre provides a subsidy of 80 per cent for making silo pits with automatic loader. To promote the processing of fodder, these facilities are needed to be spread to more number of farmers.

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COMMODITY REVIEWS

Foodgrains

During the month of March, 2014 the Wholesale Price Index (Base 2004-05=100) of pulses, increased by 0.97%, Cereals increased by 0.30% and Foodgrains increased by 0.43% respectively over the previous month.

ALL INDIA INDEX NUMBER OF WHOLESALE PRICES

(Base : 2004-2005=100)

Commodity	Weight (%)	WPI for the Month of March, 2014	WPI for the Month of February, 2014	WPI A year ago	Percentage change during	
					A month	A year
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rice	1.793	232.1	231.5	206.2	0.26	12.56
Wheat	1.116	218.2	220.7	205.4	-1.13	6.23
Jowar	0.096	281.4	261.2	250.7	7.73	12.25
Bajra	0.115	257.1	252.9	257.7	1.66	-0.23
Maize	0.217	248.2	241.3	249.1	2.86	-0.36
Barley	0.017	222.9	217.8	214.7	2.34	3.82
Ragi	0.019	331.1	317.7	337.1	4.22	-1.78
Cereals	3.373	231.3	230.6	212.5	0.30	8.85
Pulses	0.717	230.1	227.9	233.1	0.97	-1.29
Foodgrains	4.09	231.1	230.1	216.1	0.43	6.94

Source : Office of the Economic Adviser, M/o Commerce and Industry.

Behaviour Wholesale Prices

The following Table indicates the State wise trend of Wholesale Prices of Cereals during the month of March, 2014

Commodity	Main Trend	Rising	Falling	Mixed	Steady
(1)	(2)	(3)	(4)	(5)	(6)
Rice	Rising	A.P. Assam U.P.	Jharkhand	Haryana Kerala	
Wheat	Falling		Gujarat Haryana Karnataka	Rajasthan U. P.	Jharkhand
Jowar	Rising	Karnataka		A.P.	

(1)	(2)	(3)	(4)	(5)	(6)
		Maharashtra			
Bajra	Rising,	Rajasthan A.P. Haryana Rajasthan		Gujarat Maharashtra	Karnataka Tamilnadu
Maize	Rising	Haryana Jharkhand Karnataka		U.P.	A. P. Rajasthan

Prcurement of Rice

1.56 million tones of Rice (including paddy converted into rice) was procured during March 2014 as against 2.53 Million tones of rice (including paddy converted into rice) procured during March, 2013. The total procurement of Rice in the current maketing season i.e. 2013-2014, up to 31-03-2014 stood at 26. 13 million tones, as against 29.33 million tones of rice procured,during the corresponding period of last year. The details are given in the following table.

PROCUREMENT OF RICE

(in thousand tonnes)

State	Marketing Season 2013-14 (up to 31-03-2014)		Corresponding Period of last Year 2012-13		Marketing Year (October-September) 2012-13		2011-12	
	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Andhra Pradesh	3575	13.68	4042	13.78	6464	19.00	7548	21.53
Chhatisgarh	5337	20.42	4800	16.36	4804	14.12	4115	11.74
Haryana	2397	9.17	2602	8.87	2609	7.67	2007	5.72
Maharashtra	126	0.48	175	0.60	192	0.56	190	0.54
Punjab	8106	31.01	8558	29.17	8558	25.16	7731	22.05
Tamil Nadu	659	2.52	447	1.52	481	1.41	1596	4.55
Uttar Pradesh	1070	4.09	2169	7.39	2286	6.72	3357	9.58
Uttarakhand	379	1.45	427	1.46	497	1.46	378	1.08
Others	4489	17.17	6114	20.84	8129	23.89	8138	23.21
Total	**26138**	**100.00**	**29334**	**100.00**	**34020**	**100.00**	**35060**	**100.00**

Source : Department of Food & Public Distribution.

Procurement of Wheat

The total Procurement of wheat in the current marketing Season ie 2013-2014 up to August, 2013 is 25.09 million tonnes as against a total of 38.11 million tonnes of wheat procured during last year. The details are given in the following table :

PROCUREMENT OF WHEAT

(in thousand tonnes)

State	Marketing Season 2013-14 (upto 01-08-2013)		Corresponding Period of last Year (2012-13)		Marketing Year (April-March) 2012-13		2011-12	
	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total	Procure-ment	Percentage to Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Haryana	5873	23.41	8666	22.74	8665	22.71	6928	24.45
Madhya Pradesh	6355	25.33	8507	22.32	8493	22.26	4965	17.52
Punjab	10897	43.43	12836	33.68	12834	33.64	10958	38.67
Rajasthan	1268	5.06	1964	5.15	1964	5.15	1303	4.60
Uttar Pradesh	683	2.72	5063	13.29	5063	13.27	3461	12.21
Others	16	0.06	1071	2.81	1129	2.96	720	2.54
Total	**25092**	100.00	**38107**	100.00	**38148**	100.00	**28335**	100.00

Source: Department of Food and Public Distribution.

Commercial Crops

Oil Seeds and Edible Oils

The Wholesale Price Index (WPI) of nine major oilseeds as a group stood at 207.5 in March, 2014 showing an increase of 1.9 percent and 1.2 percent over the previous month and over the previous year. The Wholesale Price Index (WPI) of all individual oilseeds showed a mixed trend. The WPI of Copra (5.4 percent), Soyabean (4.5 percent) Gingelly seed (2.9 percent) Rape & Mustard Seed (1.0 percent) and Groud nut seed (0.8 percent) increased over the previous month. However, the WPI of Safflower Seed (0.5 percent), Sunflower Seed (2.0 percent)and Cotton Seed (2.0. percent) decreased over the previous month. However, the WPI of Niger seed remained unchanged over the previous month.

The Wholesale Price Index (WPI) of Edible Oils as a group stood 146.8 in March, 2014 showing an increase of 0.1 percent and 0.1 percent over the previous month and over the previous year. The WPI of Sanflower Oil (1.4 percent), Mustard Oil (1.4 percent) , Copra oil (0.1 percent), and Soyabean Oil (0.1 percent), increased over the previous month. However, the WPI of Gingelly oil (0.2 percent), Groundnut Oil (0.9 percent) Cottonseed oil (1.8 percent) increased over the previous month.

Fruits & Vegetable

The Wholesale Price Index (WPI) of Fruits & Vegetable as a group stood at 210.3in March, 2014 showing an increase of 3.3 percent 12.7 percent over the previous month and over the previous year .

Potato

The Wholesale Price Index (WPI) of Potato stood at 187.4 in March, 2014 showing an increase of 8.8 percent and 27.8 percent over the previous month and over the previous year.

Onion

The Wholesale Price Index (WPI) of Onion stood 302.0 in March, 2014 showing a fall of 3.3 percent over the previous month. However, it increased by 1.9 percent over the previous year.

Condiments & Spices

The Wholesale Price Index (WPI) of Condiments & Spices (Group) stood at 264.7 in March, 2014 showing a fall of 0.3 percent over the previous month. However, it increased by 19.1 percent over the previous year. The WPI of Black Pepper increased by 1.3 percent over the previous month. However, the WPI of Chillies (Dry) and Turmeric declined by 4.2 percent and 0.1 percent over the previous month.

Raw Cotton

The Wholesale Price Index (WPI) of Raw Cotton stood at 233.7 in March, 2014 showing an increase of 4.3 percent over the previous month. However it increased by 9.0 percent over the previous year.

Raw Jute

The Wholesale Price Index (WPI) of Raw Jute stood at 270.0 in March, 2014 showing a fall of 1.1percent and 1.2 percent over the previous month. and over the previous year.

WHOLESALE PRICE INDEX OF COMMERCIAL CROPS FOR THE MONTH OF MARCH, 2014

(Base Year : 2004-05=100)

Commodity	Latest	Month	Year	Percentage Variation over	
	Mar., 2014	Feb., 2014	Mar., 2013	Month	Year
OIL SEEDS	207.5	203.7	205.1	1.9	1.2
Groundnut Seed	197.0	195.5	265.9	0.8	-25.9
Rape & Mustard Seed	188.8	186.9	194.7	1.0	-3.0
Cotton Seed	177.7	182.6	167.2	-2.7	6.3
Copra (Coconut)	151.7	143.9	92.7	5.4	63.6
Gingelly Seed (Sesamum)	477.6	464.1	386.2	2.9	23.7
Niger Seed	171.7	171.7	182.4	0.0	-5.9
Safflower (Kardi Seed)	150.4	151.2	156.1	-0.5	-3.7
Sunflower	188.0	191.8	188.7	-2.0	-0.4
Soyabean	238.2	227.9	213.0	4.5	11.8
EDIBLE OILS	146.8	146.6	146.7	0.1	0.1
Groundnut Oil	170.5	172.0	196.8	-0.9	-13.4
Cotton Seed Oil	182.1	185.4	163.1	-1.8	11.6
Mustard & Rapeseed Oil	158.0	155.8	151.2	1.4	4.5
Soyabean Oil	158.5	158.4	158.7	0.1	-0.1
Copra Oil	123.4	123.3	115.3	0.1	7.0
Sunflower Oil	127.7	125.9	138.0	1.4	-7.5
Gingelly Oil	185.3	185.7	195.5	-0.2	-5.2
FRITS & VEGETABLES	210.3	203.6	186.6	3.3	12.7
Potato	187.4	172.3	146.6	8.8	27.8
Onion	292.1	302.0	286.6	-3.3	1.9
CONDIMENTS & SPICES	264.7	265.6	222.3	-0.3	19.1
Black Pepper	618.3	610.6	505.8	1.3	22.2
Chillies(Ory)	281.4	293.8	262.4	-4.2	7.2
Turmeric	215.9	216.1	195.6	-0.1	10.4
Raw Cotton	233.7	244.2	214.4	-4.3	9.0
Raw Jute	270.0	272.9	273.2	-1.1	-1.2

Source: Dte. of Eco. and Statistics Commercial Crops Division

STATISTICAL TABLES

Wages

1. Daily Agricultural Wages in Some States (Category-wise)

(in Rupees)

State/Distt.	Centre	Month & Year	Daily Normal Working Hour	Field Labour		Other Agri. Labour		Herdsman		Skilled Labour		
										Carpenter	Black Smith	Cobbler
				M	W	M	W	M	W	M	M	M
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Andhra Pradesh												
Krishna	Ghantasala	Oct., 2013	8	200	150	300	NA	NA	NA	NA	NA	NA
Guntur	Tadikonda	Oct., 2013	8	283	200	300	NA	NA	180	NA	NA	NA
Rangareddy	Arutla	Oct., 2013	8	231	175	225	NA	NA	NA	275	250	NA
Karnataka												
Bangalore	Harisandra	Sep., 13	8	250	200	200	175	200	180	350	250	NA
Tumkur	Gedlahali	Sep., 13	8	170	160	175	165	175	165	200	190	NA
Maharashtra												
Nagpur	Mauda	Feb., 12	8	100	100	NA	NA	NA	NA	NA	NA	NA
Ahmednagar	Akole	Feb, 12	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jharkhand												
Ranchi	Gaintalsood	April, 12	8	100	100	NA	90	90	NA	58	58	NA

1.1 Daily Agricultural Wages in Some States (Operation-wise)

(in Rupees)

State/Distt.	Centre	Month and Year	Type of Labour	Normal Daily Working Hours	Plough-ing	Sow-ing	Weed-ing	Harvest-ing	Other Agri. Labour	Herds-man	Skilled Labour		
											Car-penter	Black-smith	Cob-bler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Assam													
Barpeta	Loharapara	March, 12	M	8	180	180	180	180	180	180	180	180	180
			W	8	NA	NA	160	160	160	NA	NA	NA	NA
Bihar													
Muzaffarpur	Bhalui Rasul	April to,	M	8	130	120	80	130	150	120	200	180	250
		June, 2012	W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Shekhpura	Kutaut	May and	M	8	NA	NA	185	NA	185	NA	245	NA	NA
		June, 2012	W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chhattisgarh													
Dhamtari	Sihaba	Oct, 2013	M	8	NA	NA	NA	100	80	80	250	100	80
			W	8	NA	NA	NA	80	70	80	150	80	NA
Gujarat													
Rajkot	Rajkot	Jan., 2013	M	8	209	225	150	170	147	150	360	360	240
			W	8	NA	169	150	179	145	142	NA	NA	NA
Dahod	Dahod	Jan., 2013	M	8	100	100	100	100	100	NA	200	144	150
			W	8	NA	100	100	100	100	NA	NA	NA	NA
Haryana													
Panipat	Ugarakheri	Dec., 2013	M	8	300	300	300	300	300	NA	NA	NA	NA
			W	8	NA	250	200	250	250	NA	NA	NA	NA

1.1 Daily Agricultural Wages in Some States (Operation-wise)—*Contd.*

(in Rupees)

State/Distt.	Centre	Month and Year	Type of Labour	Normal Daily Working Hours	Ploughing	Sowing	Weeding	Harvesting	Other Agri. Labour	Herdsman	Skilled Labour		
											Carpenter	Blacksmith	Cobbler
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Himachal Pradesh													
Mandi	Mandi	Sep., 13	M	8		NA	NA	NA	NA	NA	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Kerala													
Kozhikode	Koduvally	Dec., 2013	M	4 to 8	920	550	NA	550	720	NA	650	NA	NA
			W	4 to 8	NA	NA	450	450	500	NA	NA	NA	NA
Palakkad	Elappally	Dec., 2013	M	4 to 8	400	350	NA	400	40	0500	NA	NA	NA
			W	4 to 8	NA	NA	250	300	250	NA	NA	NA	NA
Madhya Pradesh													
Hoshangabad	Sangarkhera	Dec., 2013	M	8	NA	NA	NA	NA	NA	NA	NA	NA	N.
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	N
Satna	Kotar	Dec., 2013	M	8					—NA—				
			W	8									
ShyopurKala	Vijaypur	Dec., 2013	M	8	NA	200	200	NA	NA	NA	250	250	NA
			W	8	NA	200	200	NA	NA	NA	NA	NA	NA
Odisha													
Bhadrak	Chandbali	Jan., 2013	M	8	180	130	130	250	216.66	150	350	200	200
			W	8	NA	120	120	200	180	140	NA	NA	NA
Ganjam	Aska	Jan., 2013	M	8	250	200	200	200	225	200	350	350	200
			W	8	NA	150	150	100	1400	100	NA	NA	NA
Punjab													
Ludhiana	Pakhowal	June, 2008	M	8	NA	NA	90	95	NA	99.44	NA	NA	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rajasthan													
Barmer	Vishala	Nov., 2013	M	8	300	300	NA	NA	NA	100	400	225	300
			W	8	300	300	NA	NA	NA	NA	NA	225	NA
Jalore	Panwa	Nov., 2013	M	8	NA	NA	NA	NA	NA	200	350	300	NA
			W	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tamil Nadu													
Thanjavur#	Pulvarnatham	Sep., 2013	M	8	257	294	NA	300	297.93	NA	NA	NA	NA
			W	8	NA	NA	119.29	112.5	126.43	NA	NA	NA	NA
Tirunelveli#	Malayakulam	Sep., 2013	M	8	NA	NA	NA	300	388.71	NA	NA	NA	NA
			W	8	NA	NA	140	132	NA	NA	NA	NA	NA
Tripura													
State average			M	8	238	201	203	209	207	199	253	235	240
		March, 12	W	8	NA	154	152	154	154	149	NA	NA	NA
*Uttar Pradesh**													
Meerut	Ganeshpur	Jan., 2013	M	8	205	207	206	204	206	NA	320	NA	NA
			W	8	NA	180	180	180	180	NA	NA	NA	NA
Aurraiya	Aurraiya	Jan., 2013	M	8	150	193	192	150	193	NA	300	NA	NA
			W	8	NA	160	167	120	167	NA	NA	NA	NA
Chandauli	Chandauli	Jan., 2013	M	8	150	150	125	125	125	NA	271	NA	NA
			W	8	NA	150	125	125	125	NA	NA	NA	NA

M-Man W-Woman

N. A. —Not Available N. R. —Not Reported

*- States reported district average daily wages

Prices

2. Wholesale Prices of Certain Agricultural Commodities and Animal Husbandry Products at Selected Centres in India

(Month-end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Mar.,-14	Feb.,-14	Mar.,-13
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wheat	PBW 343	Quintal	Punjab	Amritsar	1600	NA	1500
Wheat	Dara	Quintal	Uttar Pradesh	Chandausi	1650	1645	1520
Wheat	Lokvan	Quintal	Madhya Pradesh	Bhopal	1470	1755	1501
Jowar	—	Quintal	Maharashtra	Mumbai	2600	2650	2350
Gram	No III	Quintal	Madhya Pradesh	Sehore	2731	2531	2800
Maize	Yellow	Quintal	Uttar Pradesh	Kanpur	1380	1360	1350
Gram Split	—	Quintal	Bihar	Patna	4480	4570	5200
Gram Split	—	Quintal	Maharashtra	Mumbai	4600	4800	6300
Arhar Split	—	Quintal	Bihar	Patna	6700	6640	5750
Arhar Split	—	Quintal	Maharashtra	Mumbai	7200	7000	6650
Arhar Split	—	Quintal	NCT of Delhi	Delhi	6340	6345	6000
Arhar Split	Sort II	Quintal	Tamil Nadu	Chennai	6400	6330	6400
Gur	—	Quintal	Maharashtra	Mumbai	3300	3500	3380
Gur	Sort II	Quintal	Tamil Nadu	Coimbatore	4200	4200	3400
Gur	Balti	Quintal	Uttar Pradesh	Hapur	2425	2320	2520
Mustard Seed	Black (S)	Quintal	Uttar Pradesh	Kanpur	3215	3260	NA
Mustard Seed	Black	Quintal	West Bengal	Raniganj	3800	3600	4000
Mustard Seed	—	Quintal	West Bengal	Kolkata	3600	3500	3300
Linseed	Bada Dana	Quintal	Uttar Pradesh	Kanpur	4115	4070	NA
Linseed	Small	Quintal	Uttar Pradesh	Varanasi	3730	3700	3620
Cotton Seed	Mixed	Quintal	Tamil Nadu	Virudhunagar	1500	1700	1500
Cotton Seed	MCU5	Quintal	Tamil Nadu	Coimbatore	1550	1550	1550
Castor Seed	—	Quintal	Andhra Pradesh	Hyderabad	3600	3500	3250
Sesamum Seed	White	Quintal	Uttar Pradesh	Varanasi	5800	5770	6200
Copra	FAQ	Quintal	Kerala	Alleppey	8850	8450	4400
Groundnut	Pods	Quintal	Tamil Nadu	Coimbatore	3800	3800	3900
Groundnut	—	Quintal	Maharashtra	Mumbai	6000	6200	7900
Mustard Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1208	1218	NA
Mustard Oil	Ordinary	15 Kg.	West Benaal	Kolkata	1260	1230	1230
Groundnut Oil	—	15 Kg.	Maharashtra	Mumbai	1155	1140	1815
Groundnut Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	1298	1230	1830
Linseed Oil	—	15 Kg.	Uttar Pradesh	Kanpur	1380	1349	1328
Castor Oil	—	15 Kg.	Andhra Pradesh	Hyderabad	1238	1215	1155
Sesamum Oil	—	15 Kg.	NCT of Delhi	Delhi	2250	1350	1700
Sesamum Oil	Ordinary	15 Kg.	Tamil Nadu	Chennai	2775	2850	3300
Coconut Oil	—	15 Kg.	Kerala	Cochin	1920	1800	938
Mustard Cake	—	Quintal	Uttar Pradesh	Kanpur	1815	1900	NA
Groundnut Cake	—	Quintal	Andhra Pradesh	Hyderabad	2750	2714	3286
Cotton/Kapas	NH44	Quintal	Andhra Pradesh	Nandyal	4450	4500	4300
Cotton/Kapas	LRA	Quintal	Tamil Nadu	Virudhunagar	3826	4156	4366
Jute Raw	TD5	Quintal	West Benaal	Kolkata	2900	2800	2900
Jute Raw	W5	Quintal	West Benaal	Kolkata	2850	2750	2900
Oranges	—	100 No	NCT of Delhi	Delhi	542	417	583
Oranges	Big	100 No	Tamil Nadu	Chennai	580	530	490
Oranges	Nagpuri	100 No	West Benaal	Kolkata	600	500	540
Banana	—	100 No.	NCT of Delhi	Delhi	333	292	167
Banana	Medium	100 No.	Tamil Nadu	Kodaikkanal	454	448	365
Cashewnuts	Raw	Quintal	Maharashtra	Mumbai	56000	56000	46000

2. WHOLESALE PRICES OF CERTAIN AGRICULTURAL COMMODITIES AND ANIMAL HUSBANDRY PRODUCTS AT SELECTED CENTRES IN INDIA—*Contd.*

(Month-end Prices in Rupees)

Commodity	Variety	Unit	State	Centre	Mar.,-14	Feb.,-14	Mar.,-13
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Almonds	—	Quintal	Maharashtra	Mumbai	63000	62000	45000
Walnuts	—	Quintal	Maharashtra	Mumbai	65000	63000	59500
Kishmish	—	Quintal	Maharashtra	Mumbai	13000	11500	12500
Peas Green	—	Quintal	Maharashtra	Mumbai	4600	4400	3250
Tomatoes	Ripe	Quintal	Uttar Pradesh	Kanpur	1115	740	1050
Ladyfinger	—	Quintal	Tamil Nadu	Chennai	2000	2400	2400
Cauliflower	—	100 No.	Tamil Nadu	Chennai	1350	1350	1200
Potatoes	Red	Quintal	Bihar	Patna	985	810	580
Potatoes	Desi	Quintal	West Bengal	Kolkata	1000	810	620
Potatoes	Sort I	Quintal	Tamil Nadu	Mettuppalayam	—	—	1563
Onions	Pole	Quintal	Maharashtra	Nashik	800	800	850
Turmeric	Nadan	Quintal	Kerala	Cochin	11000	11500	10000
Turmeric	Salam	Quintal	Tamil Nadu	Chennai	9600	9600	8700
Chillies	—	Quintal	Bihar	Patna	8800	9200	7400
Black Pepper	Nadan	Quintal	Kerala	Kozhikode	50000	50000	32500
Ginger	Dry	Quintal	Kerala	Cochin	24000	23000	13500
Cardamom	Major	Quintal	NCT of Delhi	Delhi	126000	125000	78000
Cardamom	Small	Quintal	West Bengal	Kolkata	98000	95000	110000
Milk	Cow	100 Liters	NCT of Delhi	Delhi	NA	NA	3600
Milk	Buffalo	100 Liters	West Bengal	Kolkata	3600	3600	3200
Ghee Deshi	Deshi No 1	Quintal	NCT of Delhi	Delhi	28681	28681	26013
Ghee Deshi	—	Quintal	Maharashtra	Mumbai	34000	32000	25500
Ghee Deshi	Desi	Quintal	Uttar Pradesh	Kanpur	30650	30440	27750
Fish	Rohu	Quintal	NCT of Delhi	Delhi	10000	10500	9000
Fish	Pomphrets	Quintal	Tamil Nadu	Chennai	32000	33000	27500
Eggs	Madras	1000 No,	West Bengal	Kolkata	4500	4500	3200
Tea	—	Quintal	Bihar	Patna	20100	20000	19800
Tea	Atti Kunna	Quintal	Tamil Nadu	Coimbatore	13000	13000	9000
Coffee	Plant-A	Quintal	Tamil Nadu	Coimbatore	26000	26000	26000
Coffee	Rubusta	Quintal	Tamil Nadu	Coimbatore	14000	14000	14000
Tobacco	Kampila	Quintal	Uttar Pradesh	Farukhabad	2950	2900	2750
Tobacco	Raisa	Quintal	Uttar Pradesh	Farukhabad	2825	2800	2650
Tobacco	Bidi Tobacco	Quintal	West Benaal	Kolkata	3800	3700	3450
Rubber	—	Quintal	Kerala	Kottayam	14300	14300	16200
Arecanut	Pheton	Quintal	Tamil Nadu	Chennai	29700	29700	28000

3. Month-end Wholesale Prices of Some Important Agricultural Commodities in International Markets During Year, 2014

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.	Mar.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Cardamom	Guatmala Bold Green	U.K.	—	Dollar/M.T. Rs./Qtl.	9000.00 56079.00	9000.00 55818.00	9000.00 54216.00
Cashew Kernels	Spot U.K. 320s	U.K.	—	Dollar/1bs Rs./Qtl.	3.46 47516.61	3.44 47022.08	3.46 45938.06
	Spot U.K. 320s	U.K.	—	Dollar/M.T. Rs./Qtl.	7648.65 47658.74	7614.88 47227.49	7623.07 45912.37
Castor Oil	Any Origin ex tank Rotterdam	Nether-lands	—	Dollar/M.T. Rs./Qtl.	1600.00 9969.60	-	1700.00 10240.80
Celery Seed	ASTA cif	India	—	Dollar/M.T. Rs./Qtl.	1500.00 9346.50	1500.00 9303.00	1500.00 9036.00
Chillies	Birds eye 2005 crop	Africa	—	Dollar/M.T. Rs./Qtl.	4100.00 25547.10	4100.00 25428.20	4100.00 24698.40
Cinnamon Bark		Mada-gascar	—	Dollar/M.T. Rs./Qtl.	1100.00 6854.10	1100.00 6822.20	1100. 00 6626.40
Cloves	Singapore	Mada-gascar	—	Dollar/M.T. Rs./Qtl.	13250.00 82560.75	13250.00 82176.50	12600.00 75902.40
Coconut Oil	Crude Phillipine/ Indonesia	Nether-lands	—	Dollar/M.T. Rs./Qtl.	1280.00 7975.68	1420.00 8806.84	1355.00 8162.52
Copra	Phillipines cif Rotterdam	Phillipine pine	—	Dollar/M.T. Rs./Qtl.	806.50 5025.30	895.50 5553.89	851.00 5126.42
Corriander		India	—	Dollar/M.T. Rs./Qtl.	1500.00 9346.50	1500.00 9303.00	1500.00 9036.00
Cummin Seed		India	—	Dollar.M.T. Rs./Qtl.	2250.00 14019.75	2250.00 13954.50	2250.00 13554.00
Fennel seed		India	—	Dollar/M.T. Rs./Qtl.	2600.00 16200.60	2600.00 16125.20	2600.00 15662.40
Ginger	Split	Nigeria	—	Dollar/M.T. Rs./Qtl.	1800.00 11215.80	1800.00 11163.60	2300.00 13855.20
Groundnut kernels	US 2005, 40/50	European Ports	—	Dollar/M.T Rs./Qtl.	1250.00 7788.75	1250.00 7752.50	1220.00 7349.28
Groundnut Oil	Crude Any Ori gin cif Rotterdam	U.K.	—	Dollar/M.T Rs./Qtl.	1500.00 9346.50	1500.00 9303.00	1500.00 9036.00
Lentils	Turkish Red Split U.K. Crop 1+1 water	—	Pound/M.T	606.12 Rs./Qtl.	599.09 6230.91	606.12 6201.78	 6023.61
Maize		U.S.A	Chic-ago	C/56 lbs. Rs./Qtl	427.50 1046.85	455.50 1110.23	484.50 1147.02
Oats		Canada	Winni-peg	Dollar/M.T. Rs./Qtl.	465.48 2900.41	569.22 3530.30	445.04 2680.92
Palm Kernal Oil	Crude Malaysia/ Indonesia	Nether-lands	— —	Dollar/M.T. Rs./Qtl.	1170.00 7290.27	1375.00 8527.75	1350.00 8132.40

3. Month-end Wholesale Prices of Some Important Agricultural Commodities in International Markets During Year, 2014—*Contd.*

Commodity	Variety	Country	Centre	Unit	Jan.	Feb.	Mar.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Palm Oil	Crude Malaysian/ Sumatra	Nether-lands	— —	Dollar/M.T. Rs./Qtl.	855.00 5327.51	950.00 5891.90	923.00 5560.15
Rapeseed	Canola	Canada	Winni-peg	Can Dollar/M.T	423.80 2366.92	415.50 2316.83	458.20 2502.23
	U.K. delivered rapeseed, delivered	U.K.	—	Pound/M.T. Rs./Qtl.	278.00 2857.84	304.00 3147.01	325.00 3251.30
Rapeseed Oil	Refined bleached and deodorised	U.K.	—	Pound/M.T. Rs/Qtl.	668.00 6867.40	681.00 7049.71	706.00 7062.82
Soyabean Meal	U.K. produced 49% oil & protein	U.K.	— Rs./Qtl.	Pound/M.T. 3762.48	366.00 4244.32	410.00 4121.65	412.00
Soyabean Oil		U.S.A.	—	C/lbs Rs./Qtl.	37.10 5094.99	41.20 5631.71	40.73 5407.68
	Refined bleached and deodorised	U.K.	—	Pound/M.T. Rs/Qtl.	652.00 6702.56	695.00 7194.64	683.00 6832.73
Soyabeans	U.S. No. 2 yellow	Nether-lands	Chicago	Dollar/M.T. Rs./Qtl	563.90 3513.66	492.20 3052.62	504.70 3040.31
		U.S.A.	–	C/60 labs Rs./Qtl	1269.25 2902.49	1407.25 3203.09	1440.00 3183.56
Sunflower Seed Oil	Refined bleached and deodorised	U.K.	—	Pound/M.T. Rs./Qtl	710.00 7298.80	732.00 7577.66	696.00 6962.78
Tallow	High grade delivered	U.K.	Lon-don	Pound/M.T. Rs./Qtl	465.00 4780.20	445.00 4606.64	445.00 4451.78
Turmeric	Madras finger spot/cif	India	—	Dollar/M.T. Rs./Qtl	850.00 5296.35	850.00 5271.70	850.00 5120.40
Walnuts	Indian light halves	U.K.	—	Pound/M.T. Rs./Qtl	8130.00 83576.40	8130.00 84161.76	8130.00 81332.52
Wheat		U.S.A.	Chic-ago	C/60 lbs Rs../Qtl	551.50 1261.16	600.00 1365.68	696.75 1540.38

Source : Public Ledger.

Exchange Rate

	Jan.	Feb.	Mar.
US Dollar	62.31	62.02	60.24
CAN Dollar	55.85	55.76	54.61
UK Pound	102.80	103.52	100.04

4. SOWING AND HARVESTING OPERATIONS NORMALLY IN PROGRESS DURING MAY, 2014

State	Sowing	Harvesting
(1)	(2)	(3)
Andhra Pradesh	Autumn Rice, Sugarcane. Groundnut	Summer Rice, Onion.
Assam	Winter Rice, Maize, Tur (R), Cotton.	Summer Potato (Hills).
Bihar	Autumn Rice, Jute Mesta. Castorseed.	Summer Rice, Wheat, Barley, Gram, Linseed.
Gujarat	Sugarcane Ginger, Turmeric.	Onion.
Himachal Pradesh	Maize, Ragi, Small Millets (K), Summer Potato (Hills), Sugarcane, Ginger Chillies (Dry) Tobacco, Sesamum, Cotton, Turmeric	Wheat, Barley, Gram, Other Rabi Pulses, Linseed, Onion
Jammu & Kashmir	Autumn Rice, Jowar (K), Maize, Ragi, Small Millets (K), Mung (K), Tur (K) Other Kharif Pulses, Summer Potato, Chillies (Dry), Tobacco, Sannhemp.	Wheat, Barley, Small Millets (R), Tur (K), Sesamum, Rapeseed and Mustard Linseed, Onion.
Karnataka	Autumn Rice, Jowar (K), Maize, Ragi,Urad(K) Mung (K) , Summer Potato (Hills), Tobacco, Castorseed, Sesamum, Cotton, Sweet Potato Turmeric,Sannhemp, Onion, Tapioca.	Summer Rice, Ragi (R), Winter Potato, (Plain), Tapioca.
Kerala	Autumn Rice, Ragi, Small Millets (K), Tur(K), Urad (K), Mung (K), Other Kharif Pulses, Ginger, Turmeric, Tapioca. (Early)	Summer Rice, Other Rabi Pulses. Tapioca (Late)
Madhya Pradesh	Sugarcane, Ginger, Chillies (Dry), Turmeric.	Winter Potato (Plains), Onion.
Maharashtra	Termeric.	—
Manipur	Autumn Rice, Groundnut, Castorseed, Cotton, Turmeric	—
Orissa	Autumn Rice Sugarcane, Chillies (Dry), Jute.	Summer Rice, Cotton, Chillies (Dry)
Punjab and Haryana	Autumn Rice Summer Rice, Ragi, Small Millets (K) Tur (K), Summer Potato (Hills) Chillies (Dry), Cotton, Sweet Potato.	Wheat, Barley, Winter Potato (Plains) Summer Potato, Tobacco, Onion.
Rajasthan	Sugarcane.	Wheat, Small Millets (R) Tobacco.
Tamil Nadu	Autumn Rice Bajra, Summer Potato, Sugarcane Chillies (Dry), Groundnut, Turmeric, Sannhemp Tapioca.	Summer Rice, Jowar (R), Winter Potato (Hills), Sugarcane, Chillies, (Dry), Sesamum Onion.
Tripura	Autumn Rice, Maize, Sugarcane, Ginger, Chillies, (Dry), Sesamum, Cotton, Jute. Mesta.	—
Uttar Pradesh	Autumn Rice, Tur(K), Chillies (Dry), Groundnut Cotton, Jute Mesta, Linseed.	Summer Rice, Wheat, Barley, Sugarcane Tobacco, Rapeseed and Mustard, Sannhemp, Onion.
West Bengal	Autumn Rice, Winter Rice, Tur (K), Ginger, Chillies (Dry), Jute, Mesta.	Summer Rice, Chillies (Dry). Sesamum.
Delhi	Jowar (K), Onion.	—

(K)-Kharif (R)-Rabi.

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