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Comparing predictive accuracy through price forecasting models in cotton

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ABSTRACT : An attempt to forecast cotton prices different models were used with the objective of generating an appropriate price model in cotton price forecast. Price forecasting was tried using Artificial Neural Network (ANN) with EXCEL (Alyuda Excel Forecaster) and SPSS 16 Software. Fifteen variables were selected and data collected from 2002 to 2016. The forecast accuracy with ANN through Excel was to the tune of 94 to 97 per cent and 91 to 96 per cent in ANN through SPSS. All the three models including ARIMA showed forecast accuracy above 90 per cent. The forecasted cotton price during 2017 hovered around Rs.5000/- to Rs.5800/ q.

Price is the most important economical factor which suppliers and demanders in each market especially in organized markets such as commodity exchanges base their decisions on. According to the importance of amount and direction of price changes, forecasting its future values is necessary for market participants. Agricultural prices are difficult to forecast due to shocks from weather events around the world, the important role of government policy in the market place, and changing tastes and technology. Forecasts of agricultural prices are important to both private and public policy-makers; as well producers and consumers of agricultural products, and certain models have come into widespread use in government, academia, industry, and international agencies.

The role of price information has long been a subject of study in economics. Producers need accurate price information to make production and marketing decisions. In turn, these decisions, directly and indirectly, have impacts on groups such as plant breeders and ginners, and *vice versa*. The importance of price information, however, is not limited to the production sector. Merchants have a stake in accurate price information to be able to effectively fill orders and demands by textile mills. Textile mills need accurate price information to be able to minimize costs while producing products demanded by consumers. The more decision makers know about the market situation, the more likely that correct decisions will be made, but the information must be accurate to be of benefit to decision makers.

The sources of price information that are available to the market do not accurately represent *market* prices. But does it matter? What difference does it make if the reported prices are wrong? The answer to the first question is "yes." If market participants are using this information to make decisions, they are making incorrect decisions. This creates both operational and pricing inefficiencies in the market. That is, producers cannot optimize with respect to revenues and costs (operational inefficiency). This applies to both cotton and textile producers. The marketing system is also unable to efficiently allocate different qualities of cotton to their optimal end-uses (pricing inefficiency). Inaccuracies have direct implications for the operational and pricing efficiency of the cotton market.

Prices influence production, marketing, and consumption decisions in the cotton market. Price signals originate, in part, at the mill level because this is the point where the end-use value of the cotton is determined. This is the "demand" determined component of the price. On the other side of the market is the *availability*, or supply, of the fiber attributes. Availability of fiber, and the attributes of the fiber, can be affected by many things, some under the control of farmers and ginners (e.g., varieties planted, cultural practices, and lint cleaning) and some are random variables (e.g., weather-related forces). When the complex set of both supply and demand forces merge in the market, the result is a "price structure," The interaction of supply and demand naturally generates the price structure, but specific information about that price structure must be derived (estimated).

Price dynamics in cotton : The dynamics of cotton in terms of supply, demand, stock, trade and hence its prices are changing faster than anticipated. The patterns and paradigms of its availability and consumption have also been distinguished in last five years. Revival in demand for cotton after world economic crisis of 2008-2009 strengthened its prices during 2009-2010, then scarcity and hyper trade activities pushed the prices at unprecedented level during 2010-2011. The ratio of cotton to man-made fibre (MMF) had tilted towards MMF in post 2011 periods substantially, when international cotton prices zoomed to cross 200 cents per pounds. It resulted into demand destruction in cotton value chain globally. When the international cotton prices moderated and remained in range of 90-100 cents from Jan-2012 till June 2014, the cotton value chain started to regain some of its lost competitiveness against MMF or non-cotton textiles globally. At present, world fibre consumption ratio for cotton to MMF is 27:73, a change from 30:70 in 2009-2010. It is also an irony that when India is becoming the largest cotton producer in the world, a situation of supply glut has emerged globally.

In its first estimate of the 2017-2018 crop, the Secretariat predicts that world cotton output will rise by 2 per cent to 23.4 Mt. The expansion is the result of an increase in planted area, which is expected to grow by 5 per cent to 30.6 MHA after two seasons of contraction. After improving by 13 per cent to 781 kg/ha in 2016-2017, the world average yield is projected to decline by 2 per cent to 764 kg/ha. In 2017-2018, India's area is forecast to recover by 7 per cent to 11.2 MHA as firm domestic cotton prices and less attractive prices for competing crops attract more farmers to cotton. Assuming a national average yield of 530 kg/ha, production will increase by 1 per cent to 6 Mt. In 2017-2018, China's cotton area may expand by 3 per cent to 2.9 MHA, and cotton output in China could reach 4.8 Mt in 2017-2018. Following a season of higher than expected yields and firm cotton prices, cotton area in the United States is expected to expand by 10 per cent to 4.2 MHA in 2017-2018. During the same year, production in the United

States is projected to rise by 7 per cent to 4 Mt, assuming an average yield of 935 kg/ha. Pakistan's cotton area is forecast to increase by 3 per cent to 2.6 MHA, and assuming a yield of 739 kg/ha, Pakistan's production could reach 1.9 Mt. World cotton mill use is expected to expand by 1 per cent to 24.3 Mt in 2017-2018. Mill use in the top three consuming countries, China, India, and Pakistan, is expected to remain unchanged from 2016-2017. However, mill use is forecast to grow in Turkey, Bangladesh, and Vietnam by 2 per cent to 1.5 Mt, by 5 per cent to 1.5 Mt, and by 7 per cent to 1.2 Mt, respectively. Given the continued growth in mill use in countries that depend on imports, world cotton trade is projected to increase by 5 per cent to 8.2 Mt in 2017-2018 from 7.8 Mt in 2016-2017. Bangladesh is likely to maintain its position as the world's largest importer of cotton with its volume forecast to rise by 5 per cent to 1.5 Mt. Vietnam's import volume is projected to grow by 8 per cent to 1.3 Mt. Given the large exportable surplus and strong demand, exports from the United States are anticipated to rise by 17 per cent to 3.2 Mt in 2017-2018. India's exports are forecast to fall by 7 per cent to 875,000 tons in 2017-2018. World cotton stocks are expected to decline by 6 per cent at the end of 2016-2017 to 18.1 Mt as China reduces its stocks by 17 per cent to 9.3 Mt. However, stocks outside of China are projected to increase by 8 per cent to 8.8 Mt or 36 per cent of mill use in 2016-2017.

Cotton prices are an important concern for cotton farmers, textile mills, and shippers, but there are several factors peculiar to cotton. One is that USDA is legally prohibited from forecasting cotton prices. Another is the long-standing lack of reliable economic information available from China, the country that has come to dominate world consumption and trade in cotton in recent years. Finally, cotton prices have distinctly diverged from relatively long-standing relative price relationships in recent years. Forecasts of world cotton supply, use, stocks and prices are no better today than they were 30 years ago, despite huge advances in information technology, communications and travel.

With this background an attempt to forecast cotton prices using different models was made and tested for accuracy of the model so developed with the objective of generating an appropriate price model in cotton and forecast the price for the forthcoming year.

Price forecasting model : This project aims to assess the statistical accuracy of alternative price forecasts for cotton over years. In view of the difficulties in accurately forecasting price movements, the assessment of forecast performance has to be a relative one – measured by how certain types of forecast perform in relation to others.

There are two basic approaches of forecasting, namely structural and time series models. The structural models proceed from the first principles of consumer and producer theory to identify the demand and supply schedules and the equilibrium prices resulting from their intersection. In time series modeling, past observations of the same variable are collected and analyzed to develop a model describing the underlying relationship. One of the most important and widely used time series models is the Auto Regressive Integrated Moving Average (ARIMA) model. The popularity of ARIMA model is due to its statistical properties as well as use of well-known Box-Jenkins methodology in the model building process.

Time series models : The price forecasts derived from these models are non-structural-mechanical forecasts, *i.e.*, no particular economic theory is employed in the model specification phase of model development and the price forecasts were not adjusted to account for certain judgments of the researcher about the economic events being forecasted.

The primary concept in the analysis of time series involves the basic tools of probability theory.

The simplest form of a forecasting model is the unit root model with drift, which may be written as

Pt = á +â Pt-1 + et (11) ————(1)

Where Pt is the farmgate price of cotton at time t. The error term, et, is assumed to be white noise. If the price series contain a unit root, then a difference stationary model (or cointegration) should be used to model prices, otherwise the basic stationary model is appropriate.

Another approach to forecasting which has been applied recently in agriculture involves the formation of non-structural-mechanical forecasts based on Box and Jenkins ARIMA processes. An alternative forecasting model could be one that allows for an autoregressive process in the dth difference of Pt and moving average model for errors. A suitable time series model of this form, the ARMA model, may be written as

Pt = á + $\sum_{j=1}^{l} \beta j Pt - j + et$ ————(2)

With errors given by

et = $\sum_{i=1}^{k} \gamma i \varepsilon t - i + \varepsilon t$ ————(3)

and where åt is white noise. Such a model may be particularly appropriate for commodities where prices are mean reverting. The Box-Jenkins model is concerned with fitting a mixed Auto Regressive Integrated Moving Average (ARIMA) model to a given set of data. The main objective in fitting this ARIMA model is to identify the stochastic process of the time series and predict the future values accurately.

Recently, Artificial Neural Network (ANN) modeling has attracted much attention as an alternative technique for estimation and forecasting in economics and finance (Zhang *et al.*, 1998; Jha *et al.*, 2009). ANN is a multivariate non-linear non-parametric data driven self-adaptive statistical method. The main advantage of neural network is its flexible functional form and universal functional approximator. With ANN, there is no need to specify a particular model form for a given data set. ANN has found application in fields like biology, engineering, economics, etc. and its use in economics has been surveyed by Kuan and White (1994).

ANN learns to recognize the patterns or relationships in the data by observing a large number of input and output examples. Neural networks form by three layers: input, hidden and output layers. In neural network, the activation function is an increasing function that can assist to determine a threshold for neuron. Sigmoid4 function and Hyperbolic Tanget5 function are two common activation functions for time series forecasting models. Generally, neural networks are classified on the bases of path of information flow. If connections in a path flow from input to output it is called Feed Forward Neural Network.

Today, ANN is being applied to increasing number of real world problems of considerable complexity. The advantage of ANN lies in their resilience against distortion in the input data and their capability of learning. They are often good at solving problems which are too complex for conventional technologies e.g. problems that do not have a conventional algorithmic solution. A set of processing units when assembled in a closely interconnected network, offers a rich structures exhibiting some features of the biological neural network. Such a structure is called as artificial neural network (ANN). The ANN is a massively parallel distributed processor made of single processing units, which has a natural propensity for storing experiential knowledge and make it available for use. The procedure used to perform the learning process is called as learning algorithm, the function of which is to modify the synaptic weights of the network in an orderly fashion to attain a desired design objective. In practice, the ANN cannot provide the solution by working individually, rather it needs to be integrated into a consistent system engineering approach.

History In 1943, Warren McCulloch and Walter Pits proposed a model of computing element, called as McCulloch Pits neuron. In 1949, Donald Hebb proposed a learning scheme for pre-synaptic and post-synaptic values of variables. In 1958, Rosenblatt proposed the perceptron model, which can adjust weights by perceptron learning law. In 1960, Widraw proposed Adaline model for computing element. In 1985, Akley, Hinton and Sejnowski proposed feedback neural network with hidden units. For many years, neural networks have been used in various areas of engineering and economics in order to describe the relationship between the parameters that cannot be determined analytically. They were used to simulate learning from examples, detecting patterns, associative memorizing and recalling information.

Back propagation with feed foreword NN : Back-propagation algorithm is basically the process of back-propagating the errors from the output layers towards the input layer during training sessions. Back-propagation is necessary because the hidden units have no target values which can be used, so these units must be trained based on errors from the previous layers. The output layer has a target value which is used to compare with calculated value. As the errors are backpropagated through the nodes, the connection weights are continuously updated. Training will occur until the errors in the weights are adequately small to be accepted. On the other hand the computational complexity of Back propagation Algorithm is only O(n). These features of the algorithm are the main criteria for predicting share prices accurately. The main steps using the Back propagation algorithm as follows: Step 1**:** Feed the normalized input data sample, compute the corresponding output; Step 2: Compute the error between the output(s) and the actual target(s); Step 3: The connection weights and membership functions are adjusted; Step 4: IF Error > Tolerance THEN go to Step 1 ELSE stop. The back propagation algorithm has been used for training the network. There are two phases: 1st is the training phase and 2nd is the prediction phase. The training phase can be divided into two parts, the propagation phase and the weight update phase. In the propagation phase, first the input data is normalized for feeding the network into the input nodes using the formula:

Here,

V = Normalized Input.

V = Actual Input.

Min A, Max A = Boundary values of the old data range.

New minA , New maxA = Boundary values of the new data range. In this case it is -1 and 1 because the backpropagation can only handle data between –one to one.

When the neural network is trained then it is ready for prediction. After training with acceptable error the weights are set into the network then we give the trained network the input data set of the day which price we want to predict. The trained network then predicts the price using the given input data set. The weight change rule is a development of the perceptron learning rule. Weights are changed by an amount proportional to the error at that unit times the output of the unit feeding into the weight.

Running the network consists of

Forward pass : The outputs are calculated and the error at the output units calculated.

Backward pass: The output unit error is used to alter weights on the output units. Then the error at the hidden nodes is calculated (by *back-propagating* the error at the output units through the weights), and the weights on the hidden nodes altered using these values.

For each data pair to be learned a forward pass and backwards pass is performed. This is repeated over and over again until the error is at a low enough level (or we give up).

Analytical techniques: In this study, price forecasting was tried using Artificial Neural Network (ANN) with EXCEL (Alyuda Excel Forecaster) and SPSS 16 Software. This study is the first of its kind wherein the cotton price forecast has been attempted through these forecasting techniques.

Forecasting cotton prices with ANN through ALYUDA FORECASTER XL : Based on proprietary self-constructive neural networks, Alyuda forecasting software provides reliable forecasts even when the input data is noisy, full of non-linear dependencies or incomplete. **Alyuda forecasting software** makes it easy to start with neural nets as it automatically designs, trains and tests neural network forecasting models using the latest advances in artificial neural networks. **Alyuda forecaster XL** is forecasting Excel add-in based on neural networks.. It is the obvious choice for users, who need a **reliable and easy-to-learn forecasting neural network tool** embedded into the familiar MS Excel framework. It is **reliable** due to the implementation of the cutting-edge advances in Artificial Intelligence and ANN combined **with proven neural network forecasting techniques**. The most reliable constructive algorithm available today is implemented in Alyuda Forecaster XL. The algorithm was carefully adopted and tuned for real-world applications. Forecaster XL was designed specially to give maximum comfort to Excel users with exploiting neural networks for forecasting inside Excel. Forecaster XL is designed specifically to save time and money. It is **reliable** due to the implementation of the cutting-edge advances in Artificial Intelligence and ANN combined **with proven neural network forecasting techniques.** This forecasting neural network add-in only need to show our data and **click just one button to prepare a forecasting neural network** in Excel tailored to solve our specific problem. All features are easily accessed from additional menu items and use only standard Excel interface for data manipulation.

Nature and source of data: The study included the major cotton markets viz., in the North Zone, Raman, Muktsar, Abohar, Mansa of Punjab constituting about 81 per cent of the major cotton markets' share, Dabwali, Ellenabad, Sirsa, Uchana, Uklana, Fatehabad of Haryana and Sriganganagar, Sangriya, Goluwala, Hanumangarh, Pilli Banga of Rajasthan with about 90 per cent of the major cotton markets' share each.

In case of Central Zone, Gondal, Patan, Palitana, Jamnagar, Bodeli covered 42 per cent of the major cotton market share in Gujarat, The major cotton markets viz., Gevrai, Parbhani, Hinganghat, Shegaon, Vani of Maharashtra constituted about 39 per cent of the market share in the State whereas Sendhwa, Burhanpur, Khargone, Khandwa, Khategaon cotton markets in Madhya Pradesh occupied 67 per cent share of the State's total. Likewise in the South Zone, major cotton markets viz., Warangal, Adilabad, Adoni, Jammikunta, Bhainsa, Khammam constituted about 66 per cent share of total cotton markets in Andhra Pradesh, In case of Karnataka, Renubennur, Haveri, Raichur, Bailahongal, Kadur major cotton markets shared 39 per cent of the total cotton markets. At Tamil Nadu, Villupuram, Moolanur, Annur, Thindivanam, Gingee were the major cotton trading markets wherein 52 per cent share of the total cotton was traded. (Table I).

Based on R^2 value, 15 variables viz., Indian cotton production, Mill Use, Exports, Imports, Beginning stock, Ending stock, World cotton production, Mill use, Export, Import, Beginning stock, Import of cotton by China, MSP of cotton, Production of crude oil in India, Production of crude oil at world level were selected and data collected from 2002 to 2016 sourced from National Cotton Council of America, Statistics OECD Factbook, Min. of Agri. GOI and www.agmark.nic.in, respectively.

Table I. Major Cotton Market Share in India

States	Cotton regulated markets (No.)	Name of the major cotton markets	State's major cotton market share (%)
Punjab	44	Bariwala, Raman, Muktsar, Abohar, Mansa	81
Haryana	34	Dabwali, Ellenabad, Sirsa, Uchana, Uklana, Fatehabad	90
Rajasthan	37	Sriganganagar, Sangriya, Goluwala,Hanumangarh, Pilli Banga	90
Gujarat	130	Gondal, Patan, Palitana, Jamnagar, Bodeli	42
Maharashtra	168	Gevrai, Parbhani, Hinganghat, Shegaon, Vani	39
Madhya Pradesh	40	Sendhwa, Burhanpur, Khargone, Khandwa, Khategaon	67
Andhra Pradesh	51	Warangal, Adilabad, Adoni, Jammikunta, Bhainsa, Khammam	66
Karnataka	52	Renubennur, Haveri, Raichur, Bailahongal, Kadur	39
Tamil Nadu	58	Villupuram, Moolanur, Annur, Thindivanam, Gingee	52

Steps involved in forecasting cotton prices : Go to Excel page ® Add Input values Select Add-ins ® Click the Forecaster XL ® Create Network ®Select Input Range ® Select target range values ® Start training progress ® Final result. forecasting cotton prices with ANN through SPSS 21

Steps involved in forecasting cotton prices : Go to SPSS 21® Data view® Variable view® Analysis ® Neural Network ® Multilayer Perception ® Input values ® get output page ® Forecasting create model ® Forecast result

RESULTS AND DISCUSSION

The forecasted cotton price has been presented in Annexure I. Owing to paucity of pages, the worksheet of forecasted price for Punjab cotton markets have been presented. The actual Vs forecasted price of cotton with ANN through Excel and SPSS for the years 2004 to 2016 in the different markets of the three cotton growing zones have been presented in Tables IIa to IIc which shows almost near accuracy values.

It can be seen that ANN through Excel gave more accurate forecast with actual price when compared with ANN through SPSS 21. During the initial years of advent of Bt cotton, the price forecast was not so accurate in most of the States. The reason might be due to the fact that some of the variables considered for the analysis might not have had direct effect on the price of cotton. But in the later years, the accuracy rate had increased which might be due to the fact that the largest player of cotton in the world China- has influenced international cotton prices in a substantive way. There was a continuous fall in international prices since June 2014, as reflected by 'Cotlook A Index'. The Index was above 90 cents/lb till June 2014 and now hovering around 70 cents/lb. Though, in

TABLE IIa. Actual *V/s* forecasted price of cotton in major cotton markets

Year	North zone (Rs./q)								
	PUNJAB			HARYANA			RAJASTHAN		
	Actual price	Forecast excel	Price SPSS	Actual price	Forecast excel	Price SPSS	Actual price	Forecast excel	Price SPSS
2004	2230	2017	2176	*	*	*	2088	2168	1944
2005	1752	1770	1896	1780	1671	2004	1695	1696	1838
2006	1972	2016	1999	1827	1873	2078	1843	2161	1686
2007	2203	2219	2248	2036	2002	2183	2124	2126	1794
2008	2723	2736	2694	2474	2480	2631	2786	2803	2796
2009	2865	2662	2778	2938	2307	2490	2854	2621	2950
2010	3791	4037	3845	3176	2906	2957	3587	3755	3370
2011	4290	4248	4198	4111	4216	3717	5029	4963	4591
2012	4248	4254	4324	4191	4207	4132	4142	4188	4658
2013	4138	4458	4795	4214	4209	4292	4710	4774	4861
2014	4638	4588	4592	5081	5279	4846	4911	4835	4925
2015	4217	4193	4379	4095	4120	4152	4308	4316	4340
2016	4976	5080	-	4874	5271	-	4446	4781	-

TABLE IIb. Actual Vs forecasted Price of Cotton In Major Cotton Markets of Central Zone (Rs./qtl.)

Year	GUJARAT			MAHARASTHRA			MADHYA PRADESH		
	Actual	Forecast Price		Actual	Forecast Price		Actual	Forecast Price	
	price	excel	SPSS	price	excel	SPSS	price	excel	SPSS
2004	2326	2325	2109	2399	2222	2196	2090	2286	2221
2005	1894	2051	1958	2004	1966	2086	1776	1777	2061
2006	2063	2564	2232	1932	1920	2039	2001	2154	2014
2007	2354	2154	2516	2186	1941	2172	2306	2309	2281
2008	2795	2805	2729	2683	2714	2507	2673	2675	2677
2009	2859	2741	3090	2773	2766	2562	2726	2657	2591
2010	3620	3821	3632	3163	3681	3438	3436	3436	3319
2011	4918	4882	4861	4469	4380	4028	4449	4086	3983
2012	4162	4186	4601	3713	3761	4115	3971	3977	4067
2013	4823	4852	4619	4201	4281	4552	4377	4367	4234
2014	4622	4579	4534	4744	4584	4524	4368	4361	4024
2015	4710	4718	4415	4217	4295	4415	4061	4067	4236
2016	4960	5012	-	4483	4861	-	4369	4731	-

Table IIc. Actual Vs forecasted Price of Cotton In Major Cotton Markets of south zone (Rs./q)

Year	TAMIL NADU			KARNATAKA			ANDRA PRADESH		
	Actual	Forecast Price		Actual	Forecast Price		Actual	Forecast Price	
	price	excel	SPSS	price	excel	SPSS	price	excel	SPSS
2004	2241	2063	2351	2305	2171	2079	2209	2360	2284
2005	1651	1648	1761	1900	1755	1967	1786	1719	1831
2006	1905	2064	1969	1989	2084	2129	1987	1990	2141
2007	2247	2252	2409	2261	2048	2068	2170	2204	2255
2008	2608	2770	2688	2631	2645	2672	2760	2772	3006
2009	2655	2655	2685	2705	2684	2729	2836	2814	2788
2010	3123	3343	3151	3541	3160	3521	3426	3748	3637
2011	4136	4139	4180	4626	4714	4619	4721	4646	4173
2012	4084	4091	3975	4092	4042	4253	3934	3952	4080
2013	4525	4501	4401	4583	4560	4740	4476	4539	4248
2014	4474	4457	4360	4888	4960	4618	4454	4372	4583
2015	3748	3764	3639	4194	4135	4185	3964	3970	3901
2016	4597	4745	-	4492	4740	-	4388	4478	-

response to the low prices, cotton consumption has been increasing in some major cotton consumption countries like China, India, Bangladesh and Vietnam. Yet, these increments are not big enough to bring demand pull inflationary pressure to reverse the moderation in international cotton prices. Among major producers and exporters of cotton, the US and Brazil have significant safeguards and capability to absorb any losses for the farmers. Though they claim that the support mechanisms are price neutralization measures, the fact is they actively distort trade. And because of the very size of its operations, China is able to dictate cotton trends globally and compensate their cotton farmers in various ways. In fact, the present world cotton conundrum has its origin in Chinese cotton stock and trade policies. All growth factors and sustenance in cotton economy highly depended on prices of cotton in India.

Table III. Comparative forecast accuracy

STATES	FORECAST ACCURACY (%)		
	ARIMA	ANN (EXCEL)	ANN (SPSS)
Punjab	92.53	97.26	96.08
Haryana	92.96	96.36	92.72
Rajasthan	93.58	96.14	94.22
Gujarat	96.13	97.89	94.78
Maharashtra	93.50	95.88	92.93
Madhya Pradesh	95.23	96.72	94.65
Andhra Pradesh	95.82	96.82	95.04
Karnataka	96.95	96.01	96.18
Tamil Nadu	96.53	96.75	96.78

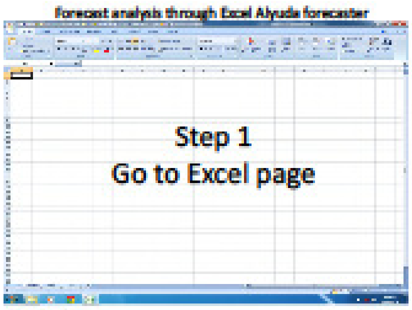
As shown in Table III, the forecast accuracy with ANN through Excel was to the tune of 95 to 97 per cent in all the cotton growing States. Alternative model ANN through SPSS was used to forecast the cotton prices with the same set of 15 variables. The forecast accuracy was to the tune of 92 to 96 per cent. All the three models including ARIMA showed forecast accuracy above 90 per cent. As the forecast accuracy was slightly higher in Excel than in SPSS 21, the price forecast was not done beyond 2015 with the latter model.

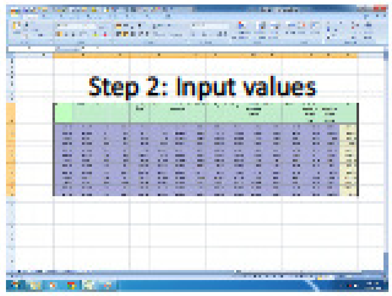
The forecasted cotton price during 2017 hovers around Rs.5000/- to Rs.5800/- predicted through ANN with Excel. It was around Rs.5262/q in case of Punjab, Rs. 5790/q in case of Haryana and Rajasthan. It was almost Rs. 5030/- to Rs. Rs.5300/q in the Central and South Zone cotton markets.

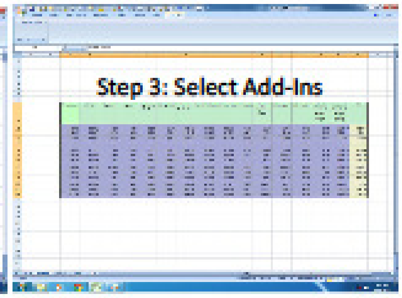
CONCLUSIONS

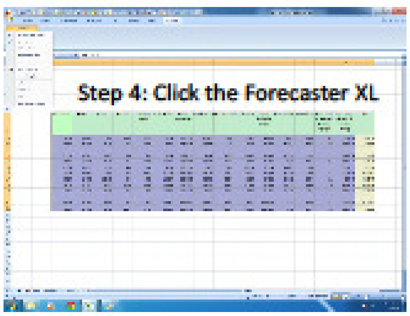
Support prices, directly or indirectly, interfere with free market principles of supply, demand and equilibrium prices. All growth factors and sustenance in cotton economy highly depended on prices of cotton in India. India has now emerged as the largest cotton producer and has the highest average growth in cotton consumption in the world. Though there has been a substantive expansion in cotton consumption through mill demands which has increased by around 60 per cent during last ten years, crop production has increased at relative better rate, that is, by 65 per cent during the same period. Thus, the country is likely to remain a cotton surplus country at least for some more years, until the domestic textiles industry is able to expand more to consume all our cotton for value added products. Therefore, currently our farmers are susceptible to global price trends and we have serious stakes in cotton exports. China's new cotton policy under which direct subsidy is given with buying from its cotton reserves since April 2014 has led to a steep decline in international prices of cotton and this has impacted Indian domestic prices. As the largest producer of cotton in the world, India has now become a critical factor with the prices and demand trends for world cotton as well as cotton textiles. MSPs have a decisive influence on domestic cotton prices. While massive MSP operations may protect the livelihood issues of farmers, they may also push up our cotton prices

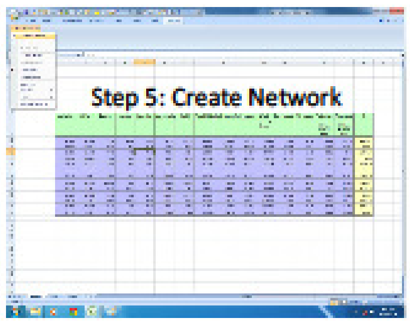
Annexure I : Forecast of cotton prices through Alyudha Forecaster XL

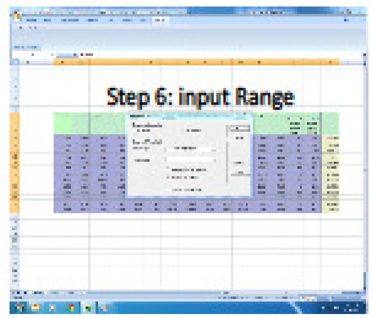


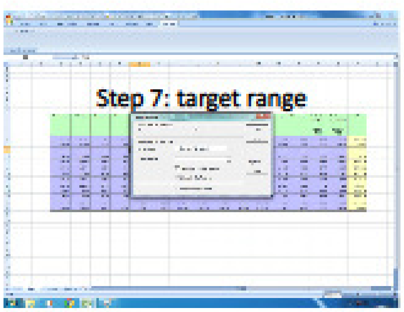


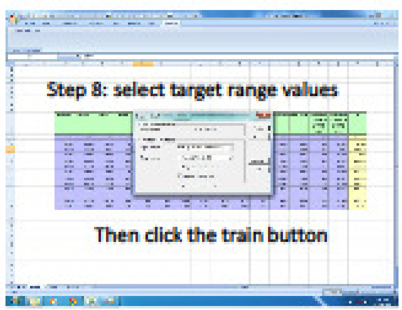


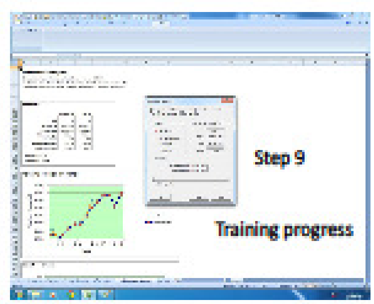


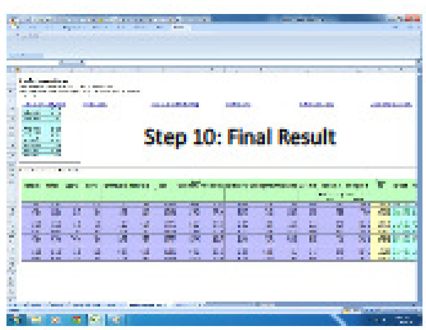












above international prices and render our cotton textiles uncompetitive in the global markets. Firm price for domestic Cotton and less attractive prices for competing crops is expected to attract more farmers to Cotton in the next season. ICAC has assumed a national average yield of 530 kg/ ha and production to increase by 1 per cent to 6 million tons during 2017-18.

The need for accurate price forecasts is indeed overwhelming as decision makers face commonly violent fluctuations in commodity prices. Cotton producers and market intermediaries require more accurate and useful forecasts in order to minimize the costs of wrong decisions. The evaluation and analysis of forecasting performance of alternative forecasting models (or techniques) can be useful to the forecast user and the forecaster by providing some measure of confidence about the forecasts. Since each forecasting method has strengths and weaknesses, it is recommended to utilize appropriate methods rather than a single method in order to minimize the forecasting error. Based on the trend of world cotton economic and trade situations, the variables considered for the price forecast may vary. Accordingly those variables are to be included with caution in forecasting the cotton prices in future.

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