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HORTICULTURE LOGISTICS SITUATION IN JHARKHAND: OPPORTUNITIES AND CHALLENGES

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Logistics is an important area for decision making at every institution level. A sound logistics system leads to good operations. In agriculture also the logistics function has an important role to play. Horticulture is one such area in agriculture which requires proper logistics facility to be viable. This sub sector of agriculture requires efficient handling and distribution of goods as the category is highly perishable in nature, therefore challenging the logistics system. The study is exploratory in nature involving identification of variables such as transportation, market yard availability, storage facility, information technology, grading facility, standardization, aggregation facility, value addition scope, cold storages availability, laboratory linkage and irrigation facility. Different significance (weights) of each variable were collected from experts, subsequently the threshold levels required for horticulture in each of the variables was collected from respondents representing horticulture stakeholders from NGOs, farmers, agriculture extension officers, followed by the actual and the preferred levels using suitable scales. The Weighted Threshold score, Weighted Actual Scores and Weighted preferred scores of each variable and the gaps between the different levels were calculated to arrive at the respective positions of the different logistics variables. Further, the variables indentified initially were then subjected to Exploratory Factor Analysis using Principal Component Analysis (PCA) in SPSS to determine the reduced set of variables (now called factors) which would explain the influence of the different variables initially identified and used further in multivariate analysis .The paper identifies the main factors in the Logistics area to be considered for improving the horticulture scenario of Jharkhand. In other words it indicates the thrust areas that the policy makers and the different Governmental and Non-Governmental institutions should consider for the betterment of the horticulture sector.

Keywords : *Horticulture logistics, Weighted threshold score, Weighted actual score, Weighted preferred scores, Exploratory factor analysis*

Introduction

"Logistics is defined as the management of movement of goods between the source and the consumption in order to meet some requirements, for example, of customers or corporations. The resources managed in logistics can include physical items, such as food, materials, animals, equipment and liquids, as well as abstract items, such as time,

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information, particles, and energy. The logistics of physical items usually involves the integration of information flow, material handling, production, packaging, inventory, transportation, warehousing, and often security" (Li, 2014).

Logistics has become a crucial function in modern economies bridging time and distance in global supply chains. World wide the logistics industry turnover is $ 100 billion. (Klink & Visser, 2004) In the world over wherever there are signs of prosperity in the area of agriculture a major part of it is contributed by the presence of a very efficient logistics system.

One such area in the overall application of the logistics function is the agriculture area. In the world over wherever there are signs of prosperity in the area of agriculture a major part of it is contributed by the presence of a very efficient logistics system. (Van Duren, E.1998).

In the agriculture sector the horticulture is one such sub sector which calls for an efficient handling of goods as the category is highly perishable in nature. The horticulture sector comprises vegetables and fruits which have very low storage life and also requires special storage system to retain its quality. The entire process of handling of crops once they are taken out from the farm requires quick post harvest management which is based on the logistics management of the farmer.

Literature Review

Out of the many activities in the logistics system, inventory management, transportation, storage and handling of outbound and inbound products, packing and information handling form an indispensible component of this system (Carsten, 2003). The emerging world of the food sectors does spell the need of the logistics management in the farm sector and the need to include ICT for better management of this sector (Farhat, 2012). Regarding the transportation component, studies have indicated that how the rural logistics and transportation cost have influenced the overall income of the farmers (Abdi, 2004). The study was made in Kenya and its showed how the transportation segment is an important contributor to the overall prosperity of the sector.

Similarly another infrastructure facility which is important is the market yard. Market yards are ideal for the farmers as they can use its for various purposes. Market Yards are a long felt need of the farmers as it helps in ensuring higher remuneration to them through proper weighing, cleaning, grading and better price realisation of their produce. But, market yard infrastructure in our country is very lopsided and its progress is satisfactory only in a few states like Rajasthan, Gujarat, Maharashtra, Karnataka and Punjab. In all other states it

is quite inadequate. The inadequacy of agricultural marketing infrastructure in other states needs urgent attention (Subrahmanyam, 1998).

Though there is a lot of scope in the horticulture sector but the potential of the horticulture sector is challenged with "about 30 % of Horticulture products produced are deemed not suitable for usage due to poor post harvest management, as they are highly perishable products. India incurs post harvest horticulture losses of more than Rs 2 lakh crore each year, owing to the absence of food processing units, modern cold storage facilities and a callous attitude towards tackling the grave issue of post harvest losses," (Ghaswalla, 2013).

It has been believed that the horticulture sector can unearth the potential and get over the problems of loss of value and comply with the standards domestic and internationally. This can happen with the focus on the efficient system involving grading, packaging, value addition. Presently the major problems include improper communication system, inadequate infrastructure, inefficient and not enough of agro-processing units , inadequate and improperly monitored marketing credit, improper market organization, improper pricing, lack of uniform grading and standardization of weights and measures; inadequate and poor dissemination of market information, poor post harvest handling and low productivity (Mwanga & Cloete, 2003).

Information technology as a logistics contributor has always remained important. Its enabling role helps the horticulture segment to bring new frontiers in the business but the present status of the penetration of ICT is far from satisfactory (Taragola, Lierde, & Gelb, 2009).

Scope and Objectives

The paper examines the present situation of the Horticulture logistics function in the State of Jharkhand and its scope for improvement so that the sector can grow in this state.

It is a research work carried out as a pilot study with the objectives of -

- Finding the different components of the logistics function of the horticulture logistics area;
- Examining the significance of each of the sub components of the horticulture logistics;
- Investigating the perception of the threshold level required in each sub component in logistics function;
- Finding the perceptual opinion of the actual state of the sub functions;

- Determining the desired level of the different functions identified in the first objective and to find the overall scores of each of the sub functions based on their weight ages and the gaps existing in each of them.

Methodology

The study is exploratory in nature and is based on a pilot study made for the doctoral study. The initial part of the study was a qualitative study based on expert opinion of the different sub components involved in the logistics component of the horticulture logistics system. After which the sub components were taken into the study involving the respondents. In total 50 respondents were sampled for this study. They comprised farmers, NGO representatives and extension officials. The respondents were from various parts of Jharkhand like Lohardaga, Dhanbad, Ranchi, Daltonganj, Latehar, Pakur, Simdega. The sampling unit was a training programme at SAMETI Ranchi, for which the researcher was a resource person. The respondents were the trainees. The respondents had male female gender representations also.

The primary set of sampled expert respondents were first asked to identify a set of important horticulture logistics variables then they were asked to find the significance (weights) of each sub factor of the horticulture logistics function based on a maximum score of 10. Subsequently the other respondents were asked to respond on the threshold levels required for horticulture in each sub factor followed by the actual and the preferred levels. The perceptual levels were measured on the basis of 11 point scale. The scale was also tested for reliability using the Cronbach Alpha Scores (please refer the findings section of the article). Subsequently the total scores and the gaps between the preferred levels and actual levels and the threshold levels were calculated.

Also for the sake of future analysis the eleven factors were subjected to Exploratory Factor Analysis using PCA for extraction of factors form the variables.

Findings, Analysis and Discussion

In the descriptive analysis of the different components the abbreviations of WTS, WAS and WPS have been used. The WTS stands for Weighted Threshold Score, WAS stands for weighted actual Score and WPS stands for the weighted preferred score. These scores are the indicators of the present position of the various variables taken into the study based on the pilot study. The Threshold scores are the minimum score levels that are required for the particular variable to contribute towards the horticulture sector. Actual Scores are the present performance scores

and are expected to be close to the preferred score levels. Preferred levels are the optimum levels expected by the different stakeholders for the variable to lens a position of strength to the variable.

The WTS, WAS and WPS are computed by multiplying the weights of the selected variables to the scores given by the respondents on the threshold levels, actual performance levels and the preferred levels. Indicated in the figures numbers 1 to 12 in the Y axis. Based on the expert opinion and the literature review the variables were studied which are discussed as follows.

Transportation Function

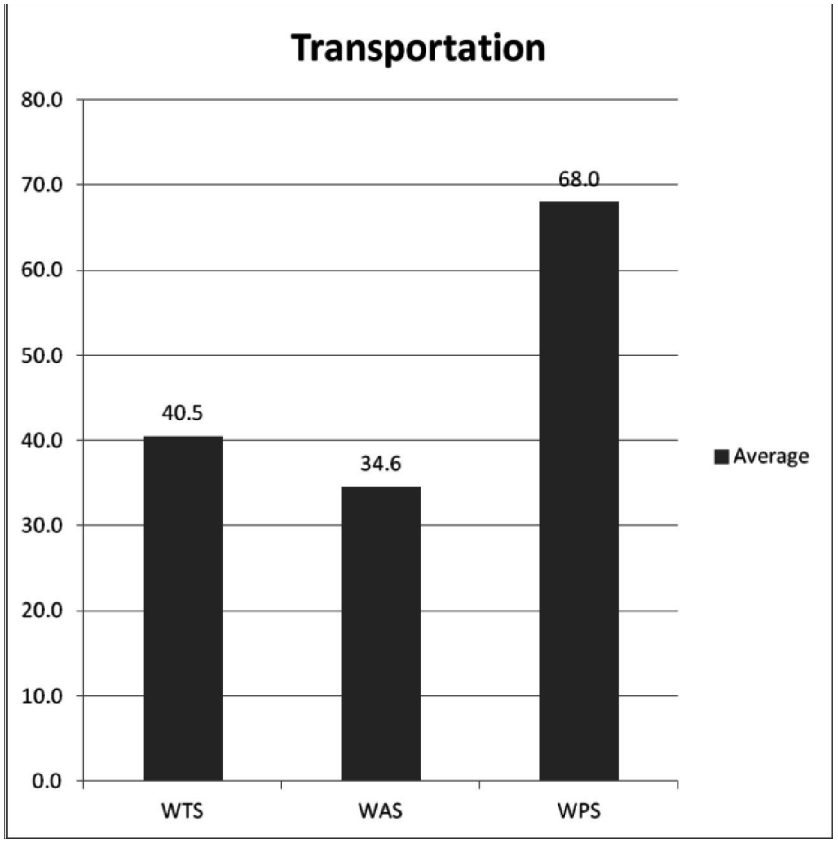


Fig. 1. Perceptual Scores on the Transportation Facility

The key element in a logistics chain is transportation system, which joints the separated activities. Transportation occupies one-third of the amount in the logistics costs and transportation systems influence the performance of logistics system hugely

In the study it was observed that the Weighted Actual Score was less than the weighted threshold Score by14.5% and lesser than the weighted preferred score by 49.1%. This indicates the poor performance of this variable in the horticulture situation.

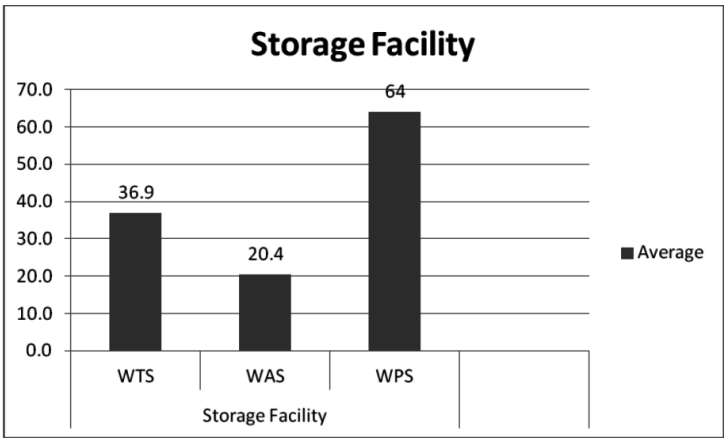


Fig. 2. Perceptual Scores of the Storage Facility

Storage Facility

Storage facility refers to the provision for storage of horticulture crops after the post harvest. It is important as the horticulture crops are required to be stored before they are reached to the market. In the present study as seen from the fig 2, we see that the WAS is much below the WTS. Hence would be very less to the WPS. The scores of the WTS was given a weighted average score of 36.9, WAS as 20.4 and WPS as 64 Here also we see that the WAS is 44.7% lesser than the WTS and 68% lesser than the average weighted preferred score levels.

Market Yard availability

Market Yard facility refers to the place which farmers have to bring their produce from their field to the first place of consumption. This is generally close to the producing places Market Yards are a long felt need of the farming community of our country as it goes a long way in ensuring higher remuneration to them through proper weighing, cleaning, grading and better price realisation of their produce. The farmers look forward to a regulated market yard as a dependable infrastructure for furtherance of their economic goal. The advantages of a regulated market yard system are immense and wherever such a system exists, it has been widely appreciated. Today the farmers consider it as a boon to them where they can confidently sell their produce and get an appropriate return for the quantity and quality they produce year after year. However, the development of regulated

market yard infrastructure in our country is very lopped sided and its progress is satisfactory only in a few states like Rajasthan, Gujarat, Maharashtra, Karnataka and Punjab. In all other states it is quite inadequate.

In the present study as shown in the fig no 3 the gap between minimum requirement and the actual levels are clearly visible and also the preferred levels are very distant from the actual levels. The WAS is 44.7% less than the WTS and 68% less than the WPS. This again shows the dismal performance in the logistics facility side of the management of the horticulture crops.

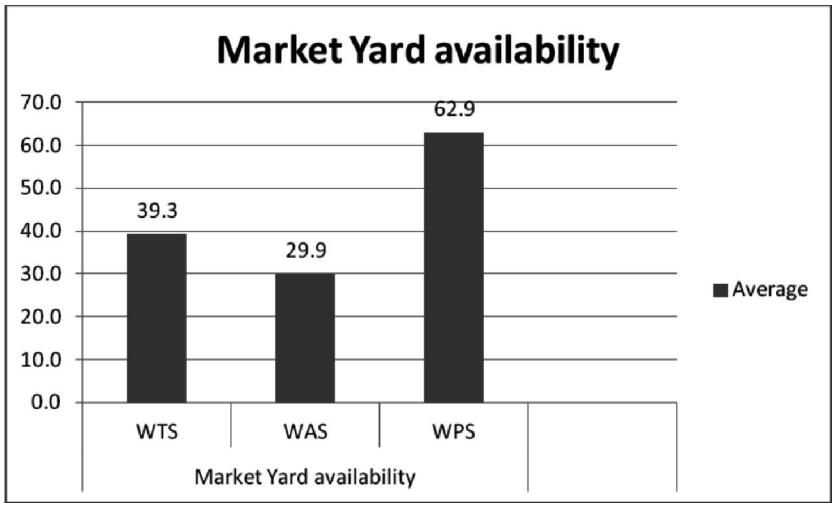


Fig. 3. Perceptual Scores of the condition Market Yard Facility

Technology

Technology also plays a very important part in the horticulture logistics. It refers to all the aspects involved which help the management of the horticulture logistics. The major part of the technology in logistics is the information technology use in logistics which is a combination of hardware and software technologies. All logistics companies big or small do invest a lot on building their logistics around sound technology. This does create an edge in delivering value to the end customers.

The study indicates as shown in fig no-4 the WAS scores are 35.7% less than the WTS and 54% less than the WPS levels. This again indicates that the technology development and usage or dissemination to the horticulture sector is poor and requires a major thrust.

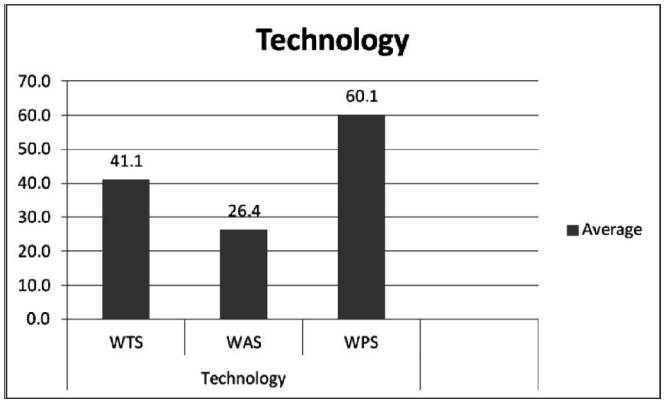


Fig. 4. Perceptual Score of the condition of Technology Dissemination

Grading Facility

Grading and Standardization plays a vital role in orderly marketing of agricultural produce which is the only tool in safeguarding the consumer interest as well as providing remunerative price to the farmers commensurate with the quality (Govt. of Odisha). The grading could be in terms of size, ripeness, taste, shape colour etc. The grading facility works at finding and putting together different quality with which the farmers will find it easy to reach the relevant market and get the true value from the produce.

Some form of grading does exist in the study area but whatever is being done is very miniscule and therefore has been regarded as low in the scores obtained. As seen in the fig below we see that the difference between the WTS and WAS is close to 33% whereas the difference between the WAS and the WPS is 61.1%. This again shows a dismal state of the existing grading provision under the horticulture logistics facility.

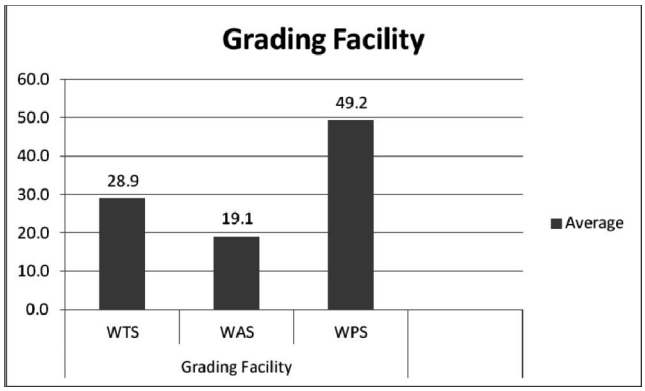


Fig. 5. Perceptual Scores of the Grading Facility

Aggregation

Aggregation is a function in logistics which refers to the consolidation of the products for the purpose of getting value. This is an important function and is applied in various kinds of products which can generate economies of scale of operations. In horticulture logistics the aggregation function is an important area as it allows even small and medium scale farmers to make their presence in the market which is seeking volumes. In this the farmers of different capacities come together to bring their produce under a platform for the purpose if gaining visibility and acceptability.

This is being done wherever there is a cooperative system working and wherever the corporates like ITC are bringing together the farmers of different capacities to generate volumes from a business which other wise is hugely fragmented because of low volume.

In the present study we found that the aggregation is being done at a very small level lower than the desired levels as well as minimum expected levels and therefore requires to be taken seriously. The WTS scores identified were 34, WAS 21.7 and WPS is 40.2 The WPS indicate that the expected levels are also not as high as other variables in the study this could because of the fact that there is less awareness among the respondents. Here we found that the WAS to be 36% below the threshold levels and 55.9% lower than the weighted preferred score levels. This also indicates the shortcoming of the variable to deliver on the expectation levels.

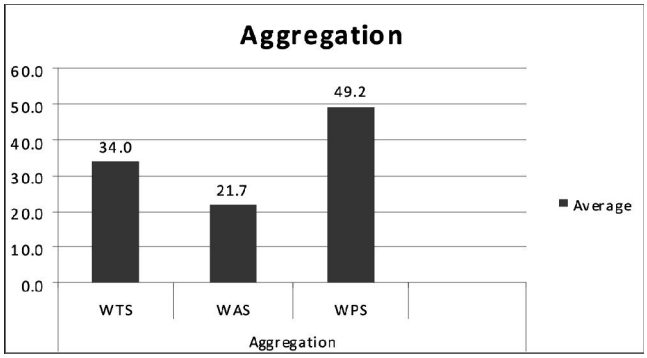


Fig. 6. Perceptual Scores of the condition of Aggregation facility

Standardization

Standardization is the process of giving certain norms for the product. These norms are given by certain pre fixed standards. It involves determination of the standard of product to be produced with regard to size, colour, form, weight, shape and quality. Standards are model products which form the basis of comparison.

According to National Commission on Agriculture standardization is defined as, "the determination of basic limits or grades in the form of specification to which manufactured goods must conform and a class into which the product of agriculture and the extra active industries may be sorted is known as standardization."

Horticulture products can have standards on the basis of different factors, based on which they are classified into different grades. Some of the factors on the basis of which standards are set: 1) On the basis of quantity, weight and measures.2) On the basis of size and shape.3) On the basis of colour such as mangoes.4) On the basis of quality.

This facility is in a basic stage in the horticulture logistics situation in Jharkhand. As seen from the respondents' opinion the Threshold levels scores, Actual level scores and preferred level scores were 27.1, 22.6 and 50.1. The Actual scores were 16.6% of the WTS and 54.8% less than the WPS.

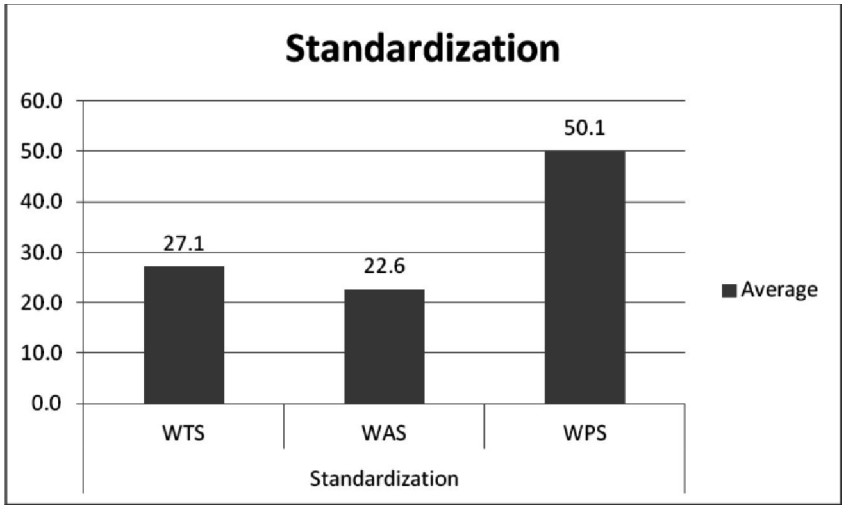


Fig. 7. Perceptual Scores of the condition of scope of Standardization

Value Addition

Value addition scope in the horticulture sector has a tremendous scope. It would provide better returns to the farmer and would be able to contribute directly or indirectly in generating income from the market.

Regarding the perceptual level of value addition variable, we found that the WTS received a score of 32.7 WAS received 20.1 and WPS received 51.37. In other words WAS was short by 38% of WTS and WAS is at 60.8% less than WPS.

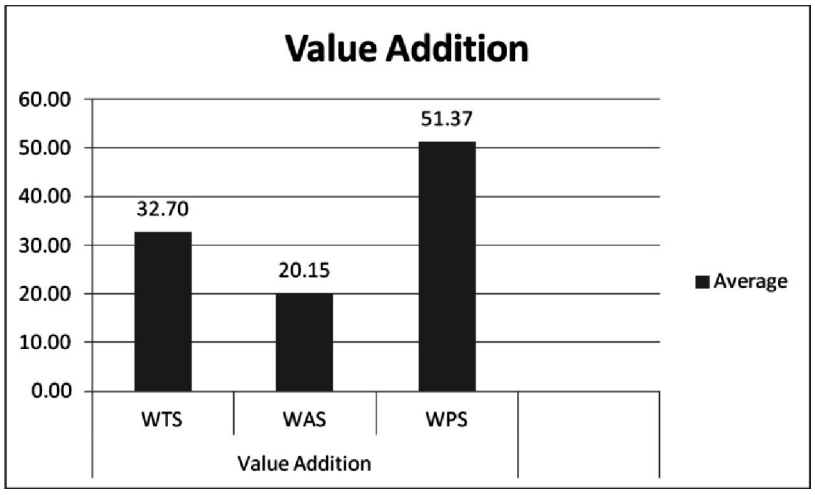


Fig. 8. Perceptual Scores on the condition of the value addition opportunities.

Cold Chain Network

Managing highly perishable products in the form of vegetables and fruits are also a challenge for everybody. The nature of the crops are such that they cannot be stored under normal storage conditions. Rather suitable temperature controlled storage are required.

As shown in the fig 9 below the WAS scores lesser than the WTS by 43.92% and the WAS is lesser than the WPS by a huge margin of 70 %.

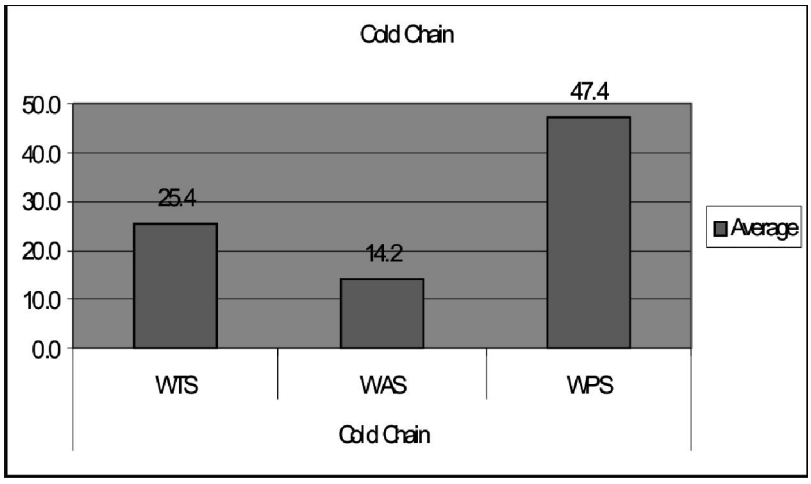


Fig. 9. Perceptual Scores of the condition of Cold Storage accessibility and availability

Laboratory Support

Lab support refers to the linkage between the scientific laboratory researching on horticulture and the field. The horticulture logistics includes the scientific linkage that would be required for the betterment of the sector. The linkage would help in the passing on of the better technology, plant breeds, seed varieties etc. to the farmers enabling them to utilize the facility available.

When this variable was researched the researcher again found a gap existing between WAS, WTS and WPS. The WAS received a weighted score of only 15.3, while WTS was 27.7 and WPS was 46.3. In % the difference between WAS and WTS was found to be 44.7% while WAS and WPS was 66.9%.

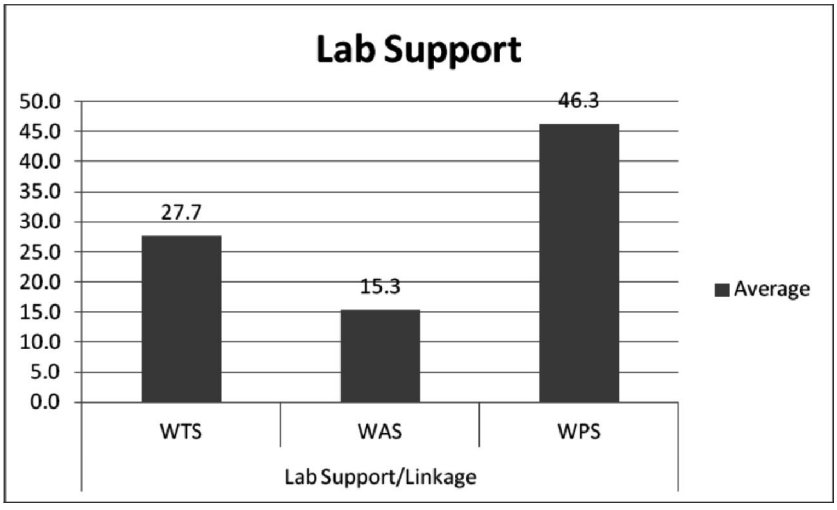


Fig. 10. Perceptual Scores of the condition of Lab support and linkage availability.

Irrigation Facility

"Irrigation in India refers to the supply of water from Indian rivers, tanks, wells, canals and other artificial projects for the purpose of cultivation and agricultural activities. In country such as India, 64% of cultivated land is dependent on monsoon. The economic significance of irrigation in India is namely, to reduce over dependence on monsoons, advanced agricultural productivity, bringing more land under cultivation, reducing instability in output levels, creation of job opportunities, electricity and transport facilities, control of floods and prevention of droughts" (Swaminathan, 2004).

Table–1: Situation of land under Irrigation

State	Agricultural Production (Million Tones)	Percentage of total Production	Productivity (tonnes per hectare)	Percent of cultivated area under irrigation
Jharkhand	1.7	0.7	1.7	5.4

Source: Gupta, Dhritman (2012-08-20).

The situation of the irrigation facility of the state is indicates in the above table which shows that the percentage of the cultivated area under irrigation is mere 5.4% which shows the dismal performance of this logistics area.

As seen in the perceptual study the WPS receives the high score of 75.9, WPS receives 49.3 and when finding the actual performance levels we found the score to be just 31.4. This is very much reflected in the percent of cultivable area table above under irrigation. In percentages we found that WAS was short of WTS by 36.3% whereas WAS was less by 58.6%.

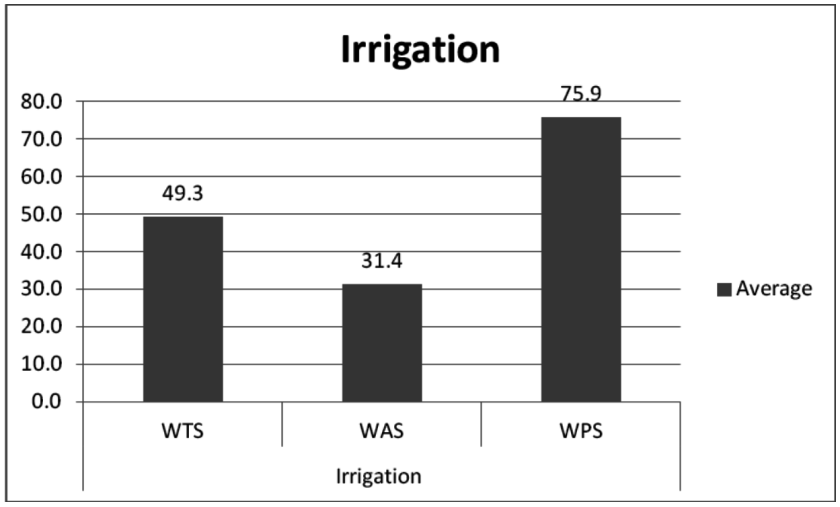


Fig. 11. Perceptual Scores on the condition of the Irrigation Facility

Composite Picture of the differnet percpetual levels of all the selected variables

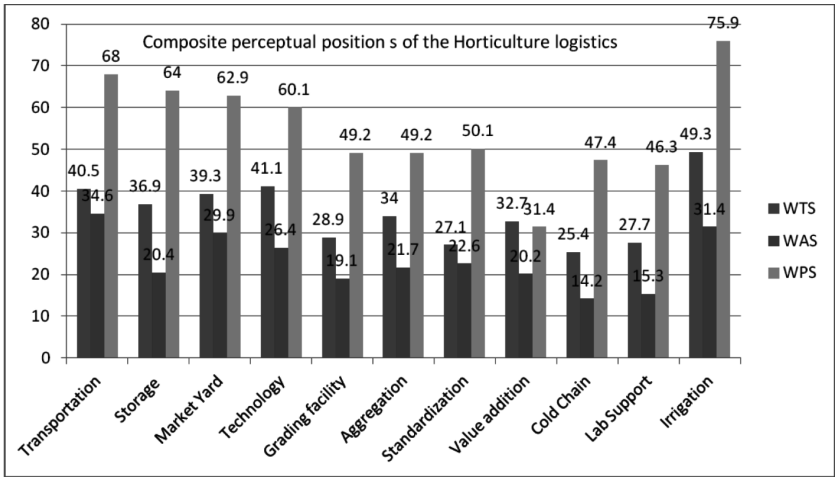


Fig. 12
WTS=Weighted Threshold Score

WAS=Weighted Actual Score
WPS=Weighted Preferred Score

As we can see from the figure above the irrigation and the transportation have a highest preferred score levels whereas Value addition , laboratory support and Cold chains have lesser preferred levels. WAS levels are highest in transportation and irrigation facility. As understood irrigation facility requires to be at the highest threshold levels for horticulture to succeed. Cold chains have less threshold levels as it was noted that in Jharkhand there is very less scope for cold storing as less quantity is produced per farmer and mostly consumed in nearby markets or taken away by agents on a specified date as informed to the farmer.

Undertaking factor analysis

After analysing the different levels of the perception of the respondents, the researcher looked into the simplified set of underlying factors which would best describe the condition as given by the eleven variables explained in the earlier part. For which the researcher has under taken Factor analysis using SPSS 20.0. Factor Analysis is a multivariate analysis which is described as an orderly simplification of several interrelated measure using mathematical procedures (Suhr, 2006).

Factor analysis has been used in earlier researches to examine the logistics condition in the agriculture area. In one of the papers, agricultural products logistics conditions of 14 cities of Hunan province

was analyzed, from the perspective of supply, demand and energy consumption. Relevant development countermeasures were given according to the results of empirical analysis.

In another study using factor analysis in the area of agriculture logistics condition identification of the influencing factors of logistics competitiveness of agricultural products at the regional level was analyzed, and subsequently factor analysis was incorporated to evaluate logistics competitiveness of agricultural products in 31 provinces of China.

In this study also a similar analysis was undertaken. The discussion is elaborated below.

Descriptive Statistics

The initial output of the analysis was a descriptive Statistics of the different factors considered.Here Irrigation facility (8.67), Transportation (8.37), and Storage Facility (8.0) are the main factors which have shown maximum mean scores

Reliability of the Scale used

Reliability -Scale: All Variables

To check the reliability of the scale used for the study Cronbach Alpha was used. Cronbach alpha is an index of reliability associated with the variation accounted for by the true score of the "underlying construct." Construct is the hypothetical variable that is being measured (Cronbach, 1951). Alpha coefficient ranges in value from 0 to 1 and may be used to describe the reliability of factors extracted from scales. The higher the score, the more reliable the generated scale is. Nunnaly (1978) has indicated 0.7 to be an acceptable reliability coefficient but lower thresholds are sometimes used in the literature.

Table–2. Case Processing Summary

		N	%
Cases	Valid	27	84.4
	Excluded[a]	5	15.6
	Total	32	100.0

a. List wise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.881	.878	11

Some Theory says that Cronbach Alpha scores of over 0.8 indicate that the scales are reliable and can be used for the study. Here in the study the Cronbach alpha scores of 0.881 are indicative of the reliability of the test and that factor analysis can be done

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.

Table–3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.591
Bartlett's Test of Sphericity	Approx. Chi-Square	220.134
	Sig.	.000

Kaiser-Meyer-Olkin (KMO) and Bartlett's Test: measures strength of the relationship among variables The KMO measures the sampling adequacy which should be greater than 0.5 for a satisfactory factor analysis to be carried out. As seen in the table no 3 above the KMO figure of 0.591 indicates the sampling adequacy for the factor analysis to be done satisfactorily.

Similarly Bartlett's test is another indication of the strength of the relationship among variables. This tests the null hypothesis that the correlation matrix is an identity matrix. From the same table, we can see that the Bartlett's test of sphericity is significant That is, its associated probability is less than 0.05. In fact, it is actually 0.000, i.e. the significance level is small enough to reject the null hypothesis. This means that correlation matrix is not an identity matrix.

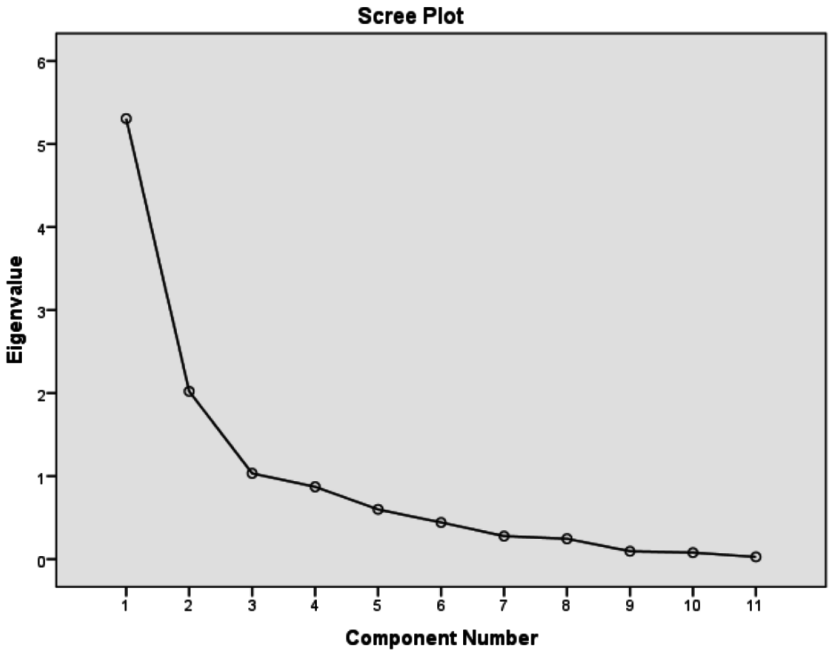
Total Variance Explained

It was found that the first factor accounts for 48.239 % of the variance, the second 18.379% and the third 9.39%. All the remaining factors are not significant.

In the rotated sum of Squared loadings which gives a better picture it was found that the first factor accounts for 40.26% whereas the second factor accounts for 20.70% and third 15.05%. As in the non rotated sum of squared loadings the other factors are insignificant.

Scree Plot

Fig 13



The scree plot is a graph of the Eigen values against all the factors. The graph is useful for determining how many factors to retain. The point of interest is where the curve starts to flatten. It can be seen that the curve begins to flatten between factors 3 and 4. Note also that factor 4 has an Eigen value of less than 1, so only three factors have been retained.

Component (Factor) Matrix

It shows the loadings of the eleven variables on the three factors extracted. The higher the absolute value of the loading, the more the factor contributes to the variable. The gap on the table represent loadings that are less than 0.5, this makes reading the table easier. We suppressed all loadings less than 0.5.

Table–4. Component Matrix[a]

	Component		
	1	**2**	**3**
Transportation weight		.611	
Storage facility		.750	
Market yard		.732	
Technology	.839		
Grading facility	.881		
Standardization	.790		
Aggregation		.502	
Value addition	.826		
Cold chains	.863		
Lab linkage	.825		
Irrigation facility	.696		.574

Extraction Method: Principal Component Analysis.

a. *3 components extracted.*

As we can see from the table above the first factor contributes most to the seven variables namely technology, Grading facility, Standardization, Value addition, Cold Chains, Lab Linkages and irrigation facility. The second factor contributes to Transportation facility, Storage facility, Market Yard facility and just barely (.502) to the aggregation variable while the third variable contributes to on of the factors along with the first factor to the irrigation facility.

Rotated Component matrix

The idea of rotation is to reduce the number factors on which the variables under investigation have high loadings. Rotation does not actually change anything but makes the interpretation of the analysis easier. Looking at the table below, we can see that transportation, and irrigation facility are substantially loaded on Factor (Component) 3 while storage facility, market yard and aggregation facility are substantially loaded on Factor 2.All the remaining variables are substantially loaded on Factor 1. These factors can be used as variables for further analysis.

Table–5. Rotated Component Matrix[a]

	Component		
	1	**2**	**3**
Transportation	.000	.609	.634
Storage facility	.228	.884	.022
Market yard	.077	.817	-.094
Technology	.830	.305	.056
Grading facility	.876	.163	.171
Standardization	.840	.009	.136
Aggregation	.058	.529	.416
Value addition	.691	.015	.569
Cold chains	.792	.187	.301
Lab linkage	.917	.014	.047
Irrigation facility	.509	-.152	.777

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.(Kaiser H. F., 1958)

a. *Rotation converged in 9 iterations.*

Table–6. Component Transformation Matrix

Component	**1**	**2**	**3**
1	.876	.297	.380
2	-.346	.936	.065
3	-.337	-.188	.923

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Based on the factor analysis finally we have identified the reduced set of three factors which have explanatory power of the eleven set of variables.

Future Scope of this Factor Analysis: The researcher intends to use these reduced set of factors to further use in researching the identified factors more elaborately through a descriptive study to measure the impact on the overall horticulture situation of the State.

Conclusion and Suggestions

In the initial part of the study all the original set of unreduced eleven factors i.e. transportation, storage of crops as part of post harvest management, cold chain availability, market yard facility for the marketing of horticulture, technology availability and dissemination, grading facility for the horticulture standardization of horticulture products, aggregation of the crops, value addition of the horticulture, laboratory linkage with the market and irrigation facility were taken for the exploratory study. In this we found there is a shortfall of every variable in the actual level compared to the minimum threshold levels. This is an indication of the poor management of the horticulture logistics area. The factors like transportation and irrigation facilities need to be given special attention along with other important consideration areas like storage, market yard and information technology dissemination. As already discussed cold storage has received less attention because of the per capita production and marketing of produce. Factor analysis also has identified irrigation and transportation to be explained by the 3rd factor and the aspect of storages and market yard explained by 2nd factor. The outcome of the paper should throw some light on the condition of the horticulture logistics in the State. It could be of relevance to the policy makers and other relevant stakeholders to develop their objectives in developing this area for overall prosperity of the farmers.

REFERENCES

Abdi, H. N. (2004). The influence of rural logistics and rural transport costs on farm income and poverty in Kenya: The case of Kisumu and Nyandarua districts, Kenya. World Bank Report. Retrieved from http://siteresources.worldbank.org/INTTLF/Resources/Kenya_Rural_Logitcis_Report.pdf

Carsten, D. (2003). Transport management. *Inwent*. Retreved from https://gc21.giz.de/ibt/en/opt/site/ilt/ibt/regionalportale/sadc/inhalt/logistics/module_01/16_components.html.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297-334.

Farhat, R. (2012). Management of logistics and ICT in food supply chain network: A conceptual framework. *International Journal of Logistics Economics and Globalisation, 4(3*), 163 – 178.

Ghaswalla, A. N. (2013, November 20).Modern cold storages needed to minimise losses in horticulture. *The Hindu – Business Line*. Retrieved from http://www.thehindubusinessline.com/economy/modern-cold-storages-needed-to-minimise-losses-in-horticulture/article5371536.ece

Government of Odisha. (n.d.). Memorandum for proposals involving expenditure on “grading and standardization of agricultural produce”. Retrieved from http://coopodisha.gov.in/PDF/new_pdf/grading.pdf

Gupta, D. (2012, August 20). How UP beats Maharashtra, Gujarat in agriculture productivity. *Indian Spend*. Retrieved from http://www.indiaspend.com/

sectors/how-up-beats-maharashtra-gujarat-in-agriculture-productivity Retrieved 2013-12-27

Kaiser H. F. (1958). The varimax criterion for analytic rotation in factor analysis. *Psychometrika*, *23*(3), 187-200.

Klink, A.V., & Visser, E.J. (2004). *Innovation in Dutch horticulture: Fresh ideas in fresh logistics. Journal of Economic and Social Geography, 95*(3), 340–346. doi: 10.1111/j.1467-9663.2004.00312.x

Li, X. (2014). *Operations management of logistics and supply chain: Issues and directions. Discrete Dynamics in Nature and Society*. Hindawi Publishing Corporation. Retrieved from file:///C:/Users/Welcome/Downloads/701938%20(2).pdf

Mwanga, R. O. M., & Cloete, M. (2003). The role of horticulture: Issues, opportunities and constraints. *Acta Hortic.* 621, 45-51. doi: 10.17660/ActaHortic.2003.621.5.

Nunnaly, J. (1978). *Psychometric theory*. New York: McGraw-Hill.

Suhr, D. D. (2006). *Exploratory or confirmatory factor analysis?* (pp. 1-17). Cary: SAS Institute.

Subrahmanyam, K. V. (1998). Horticulture in India: Organisation of production, marketing and processing. *Indian Journal of Agricultural Economics, 53(1)*, 23.

Swaminadhan, M. S. (2004, July 27). Drought, flood, seeds and suicides. *The Hindu.* Retrieved from http://www.thehindu.com/2004/07/27/stories/2004072703321000.htm

Taragola, N., Lierde, D. V., & Gelb, E. (2009). Information and communication technology (ICT) adoption in horticulture: Comparison of the EFITA, ISHS AND ILVO questionnaires. *Acta Hortic*. 831, 73-82. doi:10.17660/ActaHortic.2009.831.8

Van Duren, E., & Sparling, D. (1998). Supply chain management and the Canadian agri-food sector. *Canadian Journal of Agricultural Economics, 46*, 479–489. doi: 10.1111/j.1744-7976.1998.