Crop Productivity and Scientific Research Productivity in Horticulture : A Quadratic Relationship

Measurement of scientific productivity using scientometric indicators is easy in basic sciences. The measurement is difficult in agricultural sciences as the end user could be a farmer, industrialist or entrepreneur. Research findings[1] of immense uses to the fishermen are published in journals of lor impact factor. One such finding helped to enhance the fisheries productivity by five times. A research finding supported by related research and development efforts in needy areas could make quantum jumps in productivity like Green revolution[2]. Some research finding could create lot of impact among researchers. Tissue culture medium developed by Murashige and Skoog could be an example[3].

Bhat[4] attempted to know the proportion of literature published in each crop as well as each area of specialization using the world horticultural literature published in 1970-89. The study indicates the large discrepancies in the amount of research effort devoted to crops in relation to the size of the industry concerned.

Bradford's law of scattering was applied to measure the impact of journal "Nucleus"[5]. This method plots on logarithmic scale of cumulative number of citations to cumulative number of journals. Out study showed the trend as quadratic curve for crop productivity influenced by scientific productivity. Growth of biological science literature in India followed a modified exponential, logistic and linear patterns[6]. Volume of papers published in a year on medicinal and aromatic plants over past two decades had shown increase to the tune of 3 lo 4 fold[7]. Number of authors in an agricultural research paper has also increased from 1.32 to 1.99 over the years 1958 to 1978[8].

This report empirically analyzes the role of scientific literature in increasing productivity. The relationship between annual productivity of ten horticultural crops with number/cumulative of papers published in each crop during / until a year was analyzed. Data pertaining to 1973-1999 were used from FAO (Food and Agricultural Organization of UN) statistical database on global average annual productivity from 1973-1999 (http://apps.fao.org/page/collections ? subset= agriculture) and CABI (Commonwealth Agricultural Bureau International) Horticultural Abstracts using CD ROM 1973-1999. Three types of correlation coefficients and 11 methods of regression curve fitting were tried. Productivity of seven crops had significant positive correlation with cumulative papers published. Quadratic method gave good curve fit

In ow studies, highly significant correlation was found for tomato, eggplant, potato, carrot, cassava and banana. This clearly indicates the positive relation between scientific productivity and crop productivity. Details are given in the tables. (Table 1A and 1b) There is always a functional relationship existing with knowledge about a crop and achieving its ultimate potential productivity.

This preliminary work establishes the relationship between overall scientific productivity with crop productivity. Further work in this direction is needed to extrapolate , refine the quantification methods to precisely determine the usefulness of scientific productivity of individual or team of worker(s), journal, and country. ❐

V. ARUNACHALAM
AND C. JAYAROSE

TABLE 1A : Correlation coefficient between crop productivity and number of papers (np) or cumulative number of papers published till the year from 1973 (cnp) published :

Crop	Number of papers (np)			Cumulative number of papers published till the year from 1973 (cnp)		
	Pearson	Kendall	Spearman	Pearson	Kendall	Spearman
Tomato	0.69**	0.48**	0.66**	0.96**	0.83**	0.95**
Eggplant	0.22	0.13	0.20	0.89**	0.80**	0.93**
Spinach	-0.18	-0.31	-0.40*	-0.19	-0.29*	-0.42*
Potato	-0.07	-0.09	-0.10	63**	0.45**	0.65**
Carrot	0.35	0.25	0.40*	0.87**	0.68**	0.88**
Tapioca	-0.18	-0.03	-0.01	0.92**	0.79**	0.91**
Apple	0.28	0.20	0.34	-0.28	-0.25	-0.28
Mango	-0.12	-0.08	-0.14	-0.15	-0.01	-0.08
Citrus	0.03	0.07	0.13	-0.57**	-0.32**	-0.56**
Banana	0.63**	0.44**	0.63**	0.94**	0.82**	0.95**

TABLE 1B : *Regression curve fit* analysis of crop productivity in a year and n cumulative number of papers published till the year : (R^2 values)

Crop	*Linear*	*Inverse*	*Logarithmic*	*Quadratic*
Tomato	0.92**	0.40**	0.92**	0.93**
Eggplant	0.80**	0.14	0.41**	0.93**
Spinach	0.04	0	0.02	0.04
Potato	0.39**	0.04	0.23*	0.41**
Carrot	0.71**	0.35**	0.71**	0.80**
Tapioca	0.85**	0.55**	0.91**	0.92**
Apple	0.01	0.02	0.02	0.08
Mango	*0*	*0*	*0*	0.02
Citrus	0.31**	0.60**	0.27**	0.42**
Banana	0.87**	0.53**	0.85**	0.89**

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