



Factors determining farmers' progressiveness: A principal component analysis

RAKESH KUMAR K¹, SUDIPTA PAUL², PREMLATA SINGH³ and V P CHAHAL⁴

ICAR-Indian Agricultural Research Institute, New Delhi 110 012

Received: 22 January 2015; Accepted: 24 March 2015

ABSTRACT

Progressiveness of farmers has become the key concern for overall development of farm business. Now a days farmers give relatively more importance to scientific farm information and knowledge over physical inputs/resources and innovation over land and capital possession. The present study was conducted with a sample size of seventy two progressive farmers in ten agro-climatic zones of Karnataka state aiming at tracing out the major factors governing farmers' progressiveness. Data were collected by personal interview using Q-sort methodology and analyzed using median analysis and principal component analysis. Six different factors could finally be extracted out of 17 relatively important variables governing progressiveness of farmers. These six factors were- scientific temperament, perseverance and hard work, cosmopolitaness, achievement motivation, entrepreneurial aptitude and work satisfaction. These factors can be used as input to predictive models or as benchmarks for developing scales or indices for measuring farmers' progressiveness. Moreover, the findings imply that these psycho-social factors contribute to a larger extent towards farmers' progressiveness, hence should invariably be addressed while planning developmental programmes for the farmers.

Key words: Achievement motivation, Innovativeness, Principal component analysis, Progressiveness

For long it had been assumed that 'research produces information, extension passes it on and farmers use it' but this assumption has been proved to be an incorrect one. Generation of knowledge is not only the domain of researchers but also of farmers. Research scholars over a period of time have proved that farmers especially the resource poor farmers continually experiment, adapt and innovate. The contributions made by Rhoades (1987) and Gupta (1996) in documenting farmers' innovations are notable in this regard. This formed the base for identifying farmers as not just recipients of technology but also as experimenters or innovators who have become much better today at an incremental rate if not suddenly, through their innovative practices on the farm. Some have ventured into new areas of agri-business and have done extremely well to get good profits and as well cope up with the new era of globalization and in turn contributing to the growth of agriculture and towards making agriculture more sustainable. Critchley *et al.* (1999) stated that the farm innovators tend

to be curious, creative, proud of their innovations, willing to take risks and are skillful blending their own ideas and with ideas picked up from elsewhere. Yeboah *et al.* (2009) identified several variables through review of literature of several cases in North Carolina that are viable predictors of success for small farm operators such as enterprise diversity, effective marketing strategies, education (including workshops), concern for the environment, income not primary goal of the business, non-reliance on computer technology, risk management strategies and specialty crops (niche marketing). Progressiveness, excellence and success of farmers are generally governed by a number of individual forces operating on it, known as factors. The factors themselves are latent dimensions of more than one contributing variables. Hence to have such a perspective of the farmers as well as other stakeholders, a quantitative research was emphasized under the present study with the aim of identifying and prioritizing the determinants of farmers' progressiveness resulting in farm innovations, higher profit and overall success.

MATERIALS AND METHODS

The study was conducted during 2010-11 to 2013-14. It followed an ex-post facto research design and was purposively conducted in ten agro-climatic zones covering twenty one districts of Karnataka state. The sample of respondents in the present study comprised of highly successful seventy two (n=72) progressive farmers of Karnataka, purposively drawn from all the ten agro-climatic

¹Assistant Commissioner (e mail: rakesh.ext@gmail.com), District Bagalkot, Government of Karnataka; ²Scientist, ICAR-Zonal Project Directorate, Zone-III, Umiam, Meghalaya (e mail: sudiptaiari@gmail.com) ³Professor and Principal Scientist, Division of Agricultural Extension, IARI, New Delhi (e mail: premlataashok@gmail.com) ; ⁴Principal Scientist (Agricultural Extension), ICAR headquarters, New Delhi (e mail: chahalvp@gmail.com)

zones of the state. To find out highly successful progressive farmers, the database of award winning farmers in the said locale was accessed from reliable sources like State Department of Agriculture and ICAR- Zonal Project Directorate, Zone-VIII, Bengaluru. Thereafter, the final selection of respondents in consultation with experts in Krishi Vigyan Kendras was made which followed certain criteria like uniqueness of farm practices, innovativeness and farm economics. In-depth personal interview method was followed for collection of data. The Q-sort methodology (Stephenson 1953) was made use of in the process.

For identification and prioritization of variables influencing farmers' progressiveness, more than a hundred variables related to farmers' success were collected from literature and forty variables were finally retained for the present study in consultation with social scientists, progressive farmers and field level experts. These were prioritized following the Q-sort methodology and median analysis. In order to extract the factors governing farmers' progressiveness, the most influential variables of farmers' progressiveness as directed by the results of a median analysis were subjected to principal component analysis with varimax rotation. Factor analysis technique was used to discern and quantify the factors of farmers' progressiveness. The technique was made use of for its uniqueness in facilitating identification of key traits from the mosaic of an overlapping relationship (Kumar and Chand 2004). The technique was highly capable in achieving scientific parsimony by reducing a set of large number of variables to a convenient size of factors.

RESULTS AND DISCUSSION

Progressiveness is a complex attribute consisting of a number of dimensions, mainly psychological, socio-personal and institutional. In the present study an attempt was made to identify the specific factors which largely govern the progressiveness of farmers.

Variables influencing progressiveness of farmers

The variables which may influence farmers' progressiveness, as suggested by experts at different levels and as found in different literatures were thoroughly assessed through median analysis. The median analysis of the sample of respondents' Q-sorted perception helped in identifying seventeen 'relatively important' variables influencing farmers' progressiveness (Table 1). As indicated by the calculated median value of each variable, 'hard work', 'innovativeness' and 'commitment' were the most important variables whereas 'luck' and 'age' were the least important variables to influence farmers' progressiveness. 'Advance planning', 'need for achievement', 'information seeking behaviour' and 'patience' were highly important; 'persistence', 'access to market intelligence', 'training', 'profit orientation' and 'scientific orientation' were very important; 'work satisfaction', 'risk taking ability', 'ability to overcome constraints', 'goal orientation' and 'contact with extension agencies' were found to be quite important

Table 1 Relatively important variables (based upon median values) to influence progressiveness of farmers (n=72)

| Degree of importance | Score range (Median value) | Variables |
|----------------------|----------------------------|--|
| Most important | 7.5–8.5 | Hard work, innovativeness, commitment |
| Highly important | 6.5–7.5 | Advance planning, patience, information seeking behaviour, need for achievement |
| Very important | 5.5–6.5 | Persistence, access of market intelligence, training, profit orientation, scientific orientation |
| Quite important | 4.5–5.5 | Work satisfaction, risk taking ability, ability to overcome constraints, goal orientation, contact with extension agencies |

Source: Author's calculation

variables to influence farmers' progressiveness. It was surprising to note that variables like 'adequate working capital', 'income from other sources', 'accessibility to resources' etc. had considerably lesser influence on farmers' progressiveness.

Factors determining progressiveness of farmers

The underlying dimensions of the seventeen relatively important variables (Table 1) were extracted through principal component analysis. As the total number (17) of variables (17) considered for the factor analysis were less than thirty, and the mean communality value of the seventeen variables after extraction was > 0.7 (Table 2), Kaiser's (1958) criterion was followed to retain only those factors with Eigen values > 1.00 , hence a total of six factors all having Eigen values > 1.00 have been reported (Table 3). Only factor loadings of 0.3 or more were considered significant as earlier reported by Harman (1967), Comrey (1973) and Gorsuch (1974).

Factor I: Scientific temperament

The first factor could be explained by three psychological variables, viz. scientific orientation, participation in training and ability to overcome constraints as indicated in Table 2 by the communality values (h^2) of 0.813, 0.862 and 0.838 with very high factor loadings of 0.860, 0.850 and 0.662 respectively. Farmers with higher level of scientific orientation strive to keep themselves abreast with recent technological breakthroughs in agriculture and continually try to gather scientific knowledge of improved farm operations. Farmers with higher scientific orientation are much more capable to rightly diagnose farming related problems and find out innovative solutions to overcome those. Superior scientific orientation facilitates systematized thinking and makes decision making effective (Harilal 2014). The progressive farmers manage their farms in more or less scientific manner and try to apply scientific knowledge to overcome difficulties regularly faced in

Table 2 Factor loadings and communality values of contributing variables under each factor (n=72)

| Factor (F) | Contributing variables loadings | Factor values (h ²) | Communality |
|--------------------------------------|---------------------------------|---------------------------------|-------------|
| F-I (Scientific temperament) | Scientific orientation | 0.860 | 0.813 |
| | Training | 0.850 | 0.862 |
| | Ability to overcome constraints | 0.662 | 0.838 |
| F-II (Perseverance and hard work) | Hard work | 0.802 | 0.782 |
| | Persistence | 0.654 | 0.690 |
| | Goal orientation | 0.727 | 0.621 |
| | Planning | 0.459 | 0.717 |
| F-III (Cosmopolitaness) | Patience | 0.558 | 0.841 |
| | Extension contact | 0.692 | 0.770 |
| | Information seeking behaviour | 0.703 | 0.771 |
| F-IV (Achievement motivation) | Profit orientation | 0.755 | 0.631 |
| | Innovativeness | 0.806 | 0.783 |
| F-V (Entrepreneurial aptitude) | Need for achievement | 0.731 | 0.715 |
| | Commitment | 0.571 | 0.702 |
| F-VI (Work satisfaction) | Access of market intelligence | 0.681 | 0.704 |
| | Risk taking ability | 0.841 | 0.846 |
| | Work satisfaction | 0.776 | 0.632 |

Source: Author's calculation

Table 3 Eigen value and percent contribution of factors in total variance (n=72)

| Factor | Factor name | Eigen value (λ) | % variance contribution |
|--------|----------------------------|---------------------------|-------------------------|
| F-I | Scientific temperament | 2.704 | 15.91 |
| F-II | Perseverance and hard work | 2.554 | 15.03 |
| F-III | Cosmopolitaness | 2.102 | 12.36 |
| F-IV | Achievement motivation | 2.062 | 12.13 |
| F-V | Entrepreneurial aptitude | 1.861 | 10.95 |
| F-VI | Work satisfaction | 1.436 | 8.45 |

Source: Author's calculation

carrying out different farming operation. They up to a larger extent are inclined to attend different training programmes organized by *Krishi Vigyan Kendras* (KVKs), ICAR institutes, State Agricultural Universities (SAUs) and other organizations. Scientific temperament is thus an important factor influencing progressiveness of farmers. This factor contributed the highest variance (15.91%) in total variability of data.

Factor II: Perseverance and hard work

The second factor comprised five variables namely hard work (0.802), persistence (0.654), goal orientation (0.727), planning (0.459) and patience (0.558). The variables as mentioned clubbed together, clearly depicting that they

have high degree of inter-correlation to determine progressiveness of farmers. Persistence and patience are such important psychological attributes that lead to success of an entrepreneur. Successful entrepreneurs invariably chalk out plans and take immense care in proper execution of the same which is rarely possible without hard work. Such a habit is a clear outcome of continually taming the mind with a definite goal. The five variables had communality values of 0.782, 0.690, 0.621, 0.717 and 0.841 respectively. The factor termed as 'perseverance and hard work' it contributed the second highest (15.03%) variance in total data variability.

Factor III: Cosmopolitaness

Higher profitability of farm business run by the progressive farmers is not only due to their high profit orientation, but a combination of some other qualities like networking with extension agencies and a keen urge of continually seeking updated information on commercial farming. Progressive farmers in search of superior planting materials, farm inputs and new knowledge regarding improved farming practices, maintain strong networks with different extension agencies including KVKs, input dealers and NGOs. In the present study, three variables namely, extension contact (0.692), information seeking behaviour (0.703) and profit orientation (0.755) clubbed together and contributed high on factor III which has been named as 'cosmopolitaness'. In this context, it must be mentioned here that there are number of extension agencies, both public and private to cater to the information and input needs of the farmers, but the benefits in general are availed by those farmers having the specific attribute of cosmopolitaness. This is evident from studies that cosmopolitaness has a high degree of association with extension use efficiency (Malathesh *et al* 2009). In the present day competitive business environment, networking thus has become indispensable for successfully earning profit from a farm business. Brodt *et al.* (2006) rightly identified an effective managerial style of successful farmers and labeled it as 'networking entrepreneurs.' The communality values of these three variables were 0.770, 0.771 and 0.631 respectively. This factor contributed 12.36 percent in total variability of data.

Factor IV: Achievement motivation

The fourth contributing factor to farmers' progressiveness was termed as 'achievement motivation' as depicted by its constituent variables namely, innovativeness (0.806), need for achievement (0.731) and commitment (0.571). Farmers' behaviour, governed by high need for achievement, is not common and is limited only within a definite group of farmers. The progressive farmers are highly committed to expand their farm business in a gradual process, and in an urge to achieve more and unique, they continually experiment and strive to innovate. Even though farmer led innovations do net galore lout they have been experienced the globe. A positive and significant relationship between achievement motivation and socio-economic status of

farmers have been reported in studies (Kumar *et al.* 2013). The communality values of the three variables as mentioned were 0.783, 0.715 and 0.702 respectively. This factor was able to explain about 12.13% of the total variability in the data.

Factor V: Entrepreneurial aptitude

Entrepreneurial aptitude emerged as the fifth important factor governing progressiveness of farmers'. The factor consisted of two variables - access to market intelligence and risk taking ability with their communality values 0.704 and 0.846 and factor loadings 0.681 and 0.841 respectively. Entrepreneurial behaviour is a complex behaviour characterized by innovation, risk-taking and proactiveness (Miller 1983). The structure and several dimensions of market largely influence entrepreneurial activities (Tushman and Anderson 1986, Acs and Audretsch 1990). The present study bore testimony of the fact that entrepreneurial aptitude which consists of some important variables related to marketing, largely determine the progressiveness of farmers.

Factor VI: Work satisfaction

The last factor which determine progressiveness of farmers consisted of only a single variable namely, work satisfaction. The loading of the variable in the sixth factor was 0.776 and the communality value was 0.632. This factor could explain only 8.45% of total variability in the data.

From the findings of the study, it can be concluded that six factors, viz. scientific temperament, perseverance and hard work, cosmopolitanism, achievement motivation, entrepreneurial aptitude and work satisfaction were found to have exerted significantly high influence and contributed in determining the extent of farmers' progressiveness. Although more than 80% of the farmers in India are small to marginal having inadequate farm resources but the findings imply that they can still be progressive provided they possess the above mentioned psychological attributes.

The study clearly indicates that technical guidance, timely farm information and advisory services, training and psychological boost up for achievement motivation and entrepreneurial aptitude alongside farm input support will be highly effective in enhancing progressiveness of farmers.

REFERENCES

Acs Z J and Audretsch D B. 1990. Innovation and small firms. MIT Press, Cambridge, MA.

- Brodt S, Klonsky K and Tourte L. 2006. Farmer goals and management styles: Implications for advancing biologically based agriculture. *Agricultural Systems* **89** (1): 90–105.
- Comrey A L. 1973. *A First Course in Factor Analysis*. Academic Press, New York and London.
- Critchley W R S, Cooke R, Jallow T, Latfleur S, Laman M, Njoroge J, Nyagaha V and Saint-Firmin E. 1999. Promoting farmer innovation: harnessing local environmental knowledge in East Africa. RELMA Workshop Report Series No. 2' Nairobi.
- Gorsuch R L. 1974. *Factor Analysis*. W B Saunders company, Philadelphia.
- Gupta A. 1996. Farmers' innovation for sustainable resource management and conservation of biological diversity. (In): Food Security and Innovations: Success and Lessons Learned, pp 97–111. Heidhues, Franz and Fadani, Andrea (Eds).
- Harilal R. 2014. Scientific orientation of commercial poultry farmers of Andhra Pradesh. *International Journal of Scientific Research* **3**(8): 456.
- Harman H. 1967. *Modern Factor Analysis*, 2nd edition. University of Chicago Press, Chicago.
- Kaiser H. 1958. The varimax criterion for analytic rotation in factor analysis. *Psychometrika* **22**: 187–200.
- Kumar S and Chand P. 2004. Prevailing practices and dimensions of contract wheat seed farming in Haryana state. *Agricultural Economics Research Review* **17** (2): 149–61.
- Kumar V H M, Ali M, Kumar S, Ramanna K N and Gowda G. 2013. Personal and socio-psychological characteristics of the beneficiary farmers of community based tank management project and their relationship with socio-economic status. *International Journal of Advanced Biological Research* **3** (2): 184–7.
- Malathesh G B, Shivamurthy M, Lakshman Reddy B S and Ramakrishna Rao L. 2009. Socio-economic factors and extension use efficiency of the farmers in selected farming systems. *Karnataka Journal of Agricultural Science* **22**(2): 357–61.
- Miller D. 1983. The correlates of entrepreneurship in three types of firms. *Management Science* **29**: 770–91.
- Rhoades R E. 1987. The role of farmers in the creation and continuing development of agricultural technology and systems, Proceedings of the IDS workshop.
- Stephenson W. 1953. *The Study of Behavior*. University of Chicago Press, Chicago.
- Tushman M L and Anderson P. 1986. Technological discontinuities and organizational environments. *Administrative Science Quarterly* **31**: 439–65.
- Yeboah A K, Owens J P, Jarvetta S B and Boisson D. 2009. Case studies of successful small scale farming in North Carolina. Paper presented at the Southern Agricultural Economics Association Annual Meeting, Atlanta, Georgia.