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STATEMENT OF THE PROBLEM
OBJECTIVES
HYPOTHESIS (ES)
RESEARCH METHODOLOGY
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- Garg, Bhavet (2011): Towards a New Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

SEGMENTING THE INDIAN STATES ON THE BASIS OF PERFORMANCE INDICATORS OF NATIONAL AGRICULTURE INSURANCE SCHEME – A CLUSTER APPROACH

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ABSTRACT

The necessity to shield farmers against high fluctuations in yields and prices in agriculture has been continuing concern of agricultural policy. In India, agriculture insurance is one of the instruments for protecting farmers from wide agricultural variability. Despite various schemes launched from time to time in the country, agriculture insurance has served very restricted purpose. The coverage with respect to area, number of farmers and value of agricultural output is very small, compensation of insurance based on area approach disaffected farmers outside the compensated area, and most of the schemes are not viable. Unless the programme is restructured carefully to improve its viability, the prospects of its future expansion to include and impact more farmers are remote. This requires renewed efforts by government in terms of designing suitable mechanisms and providing pecuniary support for agriculture insurance. Providing similar help to private sector insurers would facilitate in escalating insurance coverage and in improving viability of the insurance schemes over time. In the present study, an attempt has been made to divide the states of India in various clusters depending upon the performance indicators of National Agriculture Insurance Scheme such as farmers insured, area assured, sum assured, premium, subsidy, claim and farmers benefitted.

KEYWORDS

farmers, agriculture, insurance, risk, cluster.

INTRODUCTION

Various natural disasters such as floods, storms, droughts, landslides, cyclones, and earthquakes affect the agriculture production in India. The outbreak of epidemics and man-made disasters such as fire, sale of spurious seeds, fertilisers and pesticides, etc. also makes the agriculture production more vulnerable. The consequences of all these events severely affect the farmers through loss in production and farm income, which are beyond their control. The magnitude of loss due to unfavourable eventualities is increasing with the growing commercialisation of agriculture. In some extreme cases, these harsh events become one of the factors resulting to farmer's suicides, which are now assuming serious proportions.

Agriculture insurance is considered as important mechanism to effectively address the risk to production and income from various natural and man-made events. Agriculture insurance is a means of protecting the farmers against financial losses due to uncertainties arising from named or unforeseen perils beyond their control (AIC, 2008). Unfortunately, agriculture insurance in the country has not made much advance even though the need to protect Indian farmers from agriculture variability has been a continuous concern of India's agriculture policy.

A Central Sector Scheme namely, National Agricultural Insurance Scheme (NAIS) is implemented in India since Rabi 1999-2000, as a part of risk management in agriculture with the aim of providing financial support to the farmers in the event of failure of crops as a result of natural calamities and diseases. The insurance scheme is offered to all the farmers – loanee and non-loanee, irrespective of their size of holding. The scheme is voluntary for non-loanee farmers whereas loanee farmers are covered on compulsory basis in a notified area for notified crops.

The Scheme envisages coverage of all the food crops (cereals, millets and pulses), annual commercial/horticultural crops and oilseeds, in respect of which past yield data is available for adequate number of years. The premium rates vary between 1.5% and 3.5% percent (of sum insured) for food and oilseed crops. Actuarial rates are being charged in case of commercial/horticultural crops. Under the scheme, at present, 10% subsidy in premium is available to small and marginal farmers. It is a yield guarantee scheme operating on "Area approach" basis. Any unit area of insurance i.e. block, tehsil, gram panchayat etc. can be notified by the implementing States/UTs with the outlook of availability of past yield data and capacity of the State to undertake requisite number of Crop Cutting Experiments (CCEs). The State Government/UT Administration is required to notify areas/crops well in advance of the each crop season and issue the necessary notification/instructions to all financial institutes provide data for past yield and also conduct the required number of CCEs in each notified areas for assessment of crop loss.

If actual average yield per hectare of the insured crop for the defined area in the assured season, falls short of specified Threshold yield, then all the insured farmers growing that crop in the defined area are deemed to have suffered deficit in the yield and the scheme provides coverage against such eventuality. The indemnity claims are worked out by the Agriculture Insurance Company (AIC) of India Ltd., which is the implementing agency, on the basis of yield data, based on required number of Crop Cutting Experiments, conducted by the implementing State/UT. The claims are released to banks and further banks credit the amount in the account of beneficiary farmers. Financial liabilities towards claims beyond 100% of premium for food crops and oilseeds and 150% of premium for annual horticultural/commercial crops in conjunction with 10% premium subsidy to small and marginal farmers. Bank Service charge is to be borne by the Government and is shared equally by both Central Government and respective State Government.

The scheme is optional for States/UTs. At present, the scheme is implemented by the 26 States and 2 Union Territories namely Andhra Pradesh, Assam, Bihar, Chhattisgarh, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Odisha, Rajasthan, Sikkim, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, Uttarakhand, West Bengal, Andaman & Nicobar Islands and Puducherry. The scheme is demand driven. However, the performance of the scheme can be measured in terms of farmers/area covered, sum insured, premium collected, claims paid and farmers benefitted.

LITERATURE REVIEW

Dandekar (1976) recommended that crop insurance should be linked with credit on a compulsory basis. He found that crop insurance scheme offered insurance against a probable occurrence. The chance phenomenon underlying a crop insurance scheme is the fluctuations in the yield of a crop from one year to another or from one crop season to another.

Binswanger (1980), after studying the threat in agricultural investments, risk averting tendencies of the farmers and existing strategies for changing risk, concludes that farmers' own mechanisms for loss management or risk dissemination are very costly in arid and semi-arid regions.

Jodha (1981) argued that farmers' own measures to reduce the risk in farming in semi-arid tropical India were expensive and relatively ineffective in reducing risk in farming and to fiddle with scarcity and drought conditions. Jodha found that the riskiness of farming impinges upon the investment in agriculture resulting to suboptimal allocation of resources. He also found that official credit institutions are ill equipped to decrease the revelation of Indian farmers to risks because they cannot or do not provide consumption loans to drought-affected farmers.

Subrahmanian (1984) suggested that premium rates should be revised once a year based on the cost of cultivation and the long-term average yield. In India, coverage is calculated as a percentage of the long-term average alone but it is better to reach at the coverage level on the basis of cost of cultivation and price per unit of output along with the long-term average yield.

Dandekar (1985) observed that the crop insurance scheme is based on the area approach and that a *block*/*tehsil* is taken to be the area. Indemnities to be paid to farmers in the area are calculated on the basis of the average yield for the area whereas the variations in the yield within the area are ignored. This method is considered unsatisfactory.

According to the **National Agriculture Policy (2000)**, "Despite technological and economic advancements, the condition of farmer continues to be unstable due to natural calamities and price fluctuations". The impact of this inconsistency is highlighted in drought years with news of farmer suicides from agriculture variability.

Bhende (2002) found that an accurately designed and implemented crop insurance program will shield the several vulnerable small and marginal farmers from adversity, fetch stability in the farm incomes and increase the farm production.

Sinha, Sidharth (2005), found agriculture insurance be improved by increase in the precision and timeliness of crop estimation methods achievable through the use of novel technologies. This is required to be supplemented by institution and operating procedures that enable the private sector to provide agriculture insurance.

Narayanan, H. (2006), reports that agriculture insurance is intended to play significant role in managing the risk of the agriculture sector, whose involvement in the development of economy is considerable. The role of agriculture insurance for India can never be underplayed.

Raju and Chand (2008) studied problems and prospects of agricultural insurance in India. State wise results showed that only in the states where irrigation is very dependable, it helped in lowering the risk. Those states where irrigation is not very dependable carry on to face elevated risk. In some states, farmers are exposed to twin problem of very low productivity along with high risk of production.

Singh (2010) discussed the dependence of Indian agriculture on uncertain rains. He then argued on the necessity for crop insurance as an alternative to manage production risk. It is followed by the discussion on the currently offered crop insurance products for particular crops and regions. It elaborates at length the two significant products, namely, National Agricultural Insurance Scheme and Weather Based Insurance Scheme.

Lall, Singh and Tripathi (2011) traced the problems related with agriculture insurance agencies, entrepreneurs and farmers, to discover risk in agribusiness, to be acquainted with performance of Agriculture insurance schemes in India, function of agriculture insurance schemes in shielding farmers from agricultural inconsistency, and the key problems in crop insurance and National Agriculture Insurance Scheme (NAIS).

Rathore, Burark and Jain (2011) analysed the accomplishments of crop insurance scheme on beneficiary and non-beneficiary farms in Salumber tehsil of Udaipur district during 2008-09. The study revealed that farm income per family is higher side of beneficiary farms as compared to non-beneficiary farms. The advancement of crop insurance scheme in Rajasthan has been found optimistic, as is proved through compound and linear growth rates.

Deshmukh and Khatri (2012) discussed the evolution of agricultural insurance in India and its critical evaluation. The over dependence of Indian agriculture on uncertain rains during monsoon, creates exposure to risk and uncertainty. It describes various types of risks concerned and agricultural insurance as one of the risk mitigation mechanisms in agriculture to save it from natural perils. A comparative study exhibited the accomplishments of agricultural insurance schemes run by GOI hitherto.

OBJECTIVE OF THE STUDY

To segmentize the Indian states on the basis of performance indicators of National Agriculture Insurance Scheme (NAIS).

HYPOTHESIS OF THE STUDY

Ho : There is no relationship amongst the Indian states on the basis of performance indicators of National Agriculture Insurance Scheme (NAIS).

RESEARCH METHODOLOGY

The present study involves secondary data collected from the various websites and portals related to NAIS, Agriculture Insurance Company, etc. SPSS software was used to analyse the data.

The analysis of the study is performed using K-means Cluster Approach. The objective of cluster approach is to group observations or variables into homogeneous and distinct clusters or categories. This method is being used as large data sets are involved. It will also provide the flexibility of moving a subject from one cluster to another.

In this study, the main benefit to use cluster analysis is that it will allow us to group similar states together and identify patterns between them. It will help reveal associations between the factors affecting the NAIS and help to outline structure, which might not have been apparent previously.

DATA ANALYSIS AND INTERPRETATION

The K-means cluster analysis approach is used for grouping the various participant states of India with reference to the performance indicators of National Agriculture Insurance Scheme (NAIS).

TABLE 1: INITIAL CLUSTER CENTERS

	Cluster			
	1	2	3	4
Zscore: FARMERSINSURED	2.13548	-.72457	1.34767	2.74213
Zscore: AREAASSURED	3.50378	-.64472	1.00654	1.08889
Zscore: SUMASSURED	2.52191	-.68886	1.16116	.80518
Zscore: PREMIUM	2.58944	-.66680	.53957	1.43397
Zscore: SUBSIDY	-.01449	-.55986	.02773	2.98729
Zscore: CLAIM	1.74965	-.68413	-.01204	.99402
Zscore: FARMERSBENEFITTED	1.54007	-.74857	.85231	3.07469

Table 1 indicates the Initial Cluster Centers. This table shows the seed points for the start of the analysis for those clusters which relative fall apart on the clustering variables, viz. farmers insured, area assured, sum assured, premium, subsidy, claim and farmers benefitted. The values in this table are the Z-scores of the above said variables.

TABLE 2: ITERATION HISTORY

Iteration	Change in Cluster Centers			
	1	2	3	4
1	1.790	0.269	1.469	.000
2	.000	.099	.229	.000
3	.000	.101	.200	.000
4	.000	.000	.000	.000

Table 2 shows the changes in the cluster centers from one iteration to another. The final cluster was obtained after the fourth iteration.

TABLE 3: FINAL CLUSTER CENTERS

	Cluster			
	1	2	3	4
Zscore: FARMERSINSURED	1.55042	-.67661	.42905	2.74213
Zscore: AREAASSURED	2.14594	-.62447	.30810	1.08889
Zscore: SUMASSURED	2.35134	-.66210	.34181	.80518
Zscore: PREMIUM	2.40715	-.64563	.20933	1.43397
Zscore: SUBSIDY	.81494	-.54654	.41407	2.98729
Zscore: CLAIM	2.26388	-.65948	.34576	.99402
Zscore: FARMERSBENEFITTED	1.39338	-.68818	.46950	3.07469

Table 3 shows the Final Cluster Centers. This table indicates that Cluster 1 is significantly different in terms of farmers insured, area assured, sum assured, premium, subsidy, claims and farmers benefitted as compared to other three clusters. Cluster 1 includes Andhra Pradesh, Gujarat and Madhya Pradesh. It is very low in terms of subsidy as compared to Cluster 4.

Cluster 2 includes Assam, Goa, Haryana, Himachal Pradesh, Jharkhand, Kerala, Manipal, Meghalaya, Mizoram, Sikkim, Telangana, Tripura, Uttarakhand, Andaman & Nicobar Islands, Puducherry and Jammu & Kashmir. All the performance indicators of NAIS were found to be very low in these states.

In Cluster 3, states such as Bihar, Chattisgarh, Karnataka, Odisha, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal are included. In this cluster, the performance indicators relating to farmers insured, subsidy and farmers benefitted are significantly different from the other clusters.

Only Maharashtra falls under Cluster 4. The performance indicators are significantly different relating to farmers insured, subsidy and farmers benefitted.

TABLE 4: ANOVA

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Zscore: FARMERSINSURED	7.843	3	.145	24	54.215	.000
Zscore: AREAASSURED	7.333	3	.208	24	35.197	.000
Zscore: SUMASSURED	8.395	3	.076	24	110.910	.000
Zscore: PREMIUM	8.820	3	.023	24	391.515	.000
Zscore: SUBSIDY	5.689	3	.414	24	13.746	.000
Zscore: CLAIM	8.093	3	.113	24	71.371	.000
Zscore: FARMERSBENEFITTED	8.206	3	.099	24	82.722	.000

Table 4 indicates the variables, which are most important in the cluster solution. Mean square in the Cluster column indicates variances in the variable, which can be attributed to the cluster. Mean square in the Error column indicates variances in the variable, which cannot be attributed to the cluster. F-ratio indicates the ratio of cluster variance to error variance. Large F value indicates variables that are important for segregating the clusters. In this case, premium and sum assured have the maximum F value making them the most important factors for segregation. The p value indicates that the cluster groups are significantly different on all the variables such as farmers insured, area assured, sum assured, premium, subsidy, claim and farmers benefitted.

TABLE 5: CLUSTER MEMBERSHIP

Case Number	State	Cluster	Distance
1	1	1	.850
2	2	2	.051
3	3	3	1.271
4	4	3	1.397
5	5	2	.090
6	6	1	1.784
7	7	2	.040
8	8	2	.056
9	9	2	.958
10	10	3	.972
11	11	2	.043
12	12	1	1.790
13	13	4	.000
14	14	2	.081
15	15	2	.086
16	16	2	.091
17	17	3	.724
18	18	3	1.406
19	19	2	.091
20	20	3	1.961
21	21	2	.091
22	22	2	.088
23	23	3	1.592
24	24	2	.034
25	25	3	2.087
26	26	2	.089
27	27	2	.083
28	28	2	.084

Table 5 indicates cluster membership for each state. Distance column of this table tells the distance between the state and the cluster center. This distance is used to obtain some knowledge about the representation of the states for the concerned cluster. A small distance indicates that the state is a good representative of that cluster and large distance value indicates that the state is not a good representative of that cluster. In this case, Andhra Pradesh, Haryana, Odisha and Maharashtra are the best representatives of Cluster 1, 2, 3 and 4, respectively.

TABLE 6: NUMBER OF CASES IN EACH CLUSTER

Cluster 1	3.000
2	16.000
3	8.000
4	1.000
Valid	28.000
Missing	.000

Table 6 shows the number of states in each cluster. It indicates big mismatch in the proportional size of the cluster in the cluster solution. The study has observed three states in Cluster 1, 16 states in Cluster 2, 8 states in Cluster 3 and 1 state in Cluster 4. It shows that the states are performing very differently with respect to the performance indicators of NAIS.

CONCLUSION

The necessity to shield farmers against high fluctuations in yields and prices in agriculture has been continuing concern of agricultural policy. In India, agriculture insurance is one of the instruments for protecting farmers from wide agricultural variability. The present study has divided the states in four clusters depending upon the performance indicators of National Agriculture Insurance Scheme such as farmers insured, area assured, sum assured, premium, subsidy, claim and farmers benefitted. Out of all the mentioned performance indicators, premium and sum assured have the maximum F value making them the most important factors for segregation. The study also shows that Andhra Pradesh, Haryana, Odisha and Maharashtra are the best representatives of their respective clusters.

Despite progress of irrigation and improvement in infrastructure and communication, agriculture production and farm income remain highly vulnerable to natural events and market uncertainties. The risk is much higher for farm income than production. In a country where agriculture is at the clemency of the vagaries of monsoon and other factors beyond the control of the farmer, the importance of agricultural insurance is not in doubt and needs no emphasis. Insurance provides people with a reasonable degree of security and assertion that they will be sheltered in the incident of a calamity or failure of any sort.

Despite various schemes implemented from time to time in the country, agriculture insurance has served very limited purpose. The coverage in terms of area, number of farmers and worth of agricultural production is very small, payment of indemnity based on area approach disaffected farmers outside the compensated area, and most of the schemes are not viable. Expanding the coverage of crop insurance would therefore augment the government costs considerably. Unless the programme is restructured carefully to improve its viability, the prospects of its future expansion to include and impact more farmers are remote. This requires improved efforts by government with respect to designing suitable mechanisms and providing financial support for agriculture insurance. Providing related help to private sector insurers would help in escalating insurance coverage, and in getting better viability of the insurance schemes over time.

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