A Study and Application of Sample Surveys on the Vegetable Industry in China

Qingwei Peng
Hebei Survey Office, China Statistic Bureau, Hebei Province
No.494, Hezuo Road
Shijiazhuang, China.
E-mail:pengqingwei@sina.com, pengqingwei@hotmail.com

Suli Xing
Hebei Agricultural Resources and Environment Institute,
Hebei Academy of Agriculture and Forestry Sciences,
No. 598, Heping Road
Shijiazhuang, China
E-mail: xing_suli@yahoo.com.cn

Abstract: To study a new sampling survey method and determine new indices which coincidence with the current economy system and market environment for the Chinese vegetable industry, this paper adopted a sampling survey method and designed and applied a new vegetable crops sampling survey and reporting table system (VSS) based on scientific, practicability, usability, anti-intervention and economy principles since 2002. VSS improved or developed the following for six sectors: survey contents, sampling methods, indices establishment, coding, survey methods and estimation methods. As a result, the following were accomplished:

1. Developed new benefits indices for vegetables that can represent the general vegetable production status more scientifically and truthfully, improving the quality of survey result and enhancing its value.
2. Determined sampling site by using city data as a sample frame. This can meet the needs of the classification administration and will diminish sampling error induced by marked differences of natural resources and production levels.
3. Farmer establish production logs for sampled units supports needs of survey indices, enhance availability, increases authenticity, and can provide correlative information.
4. The author has now practiced VSS for five years, made it to be perfect gradually, acquired good results in practices, received approval of specialists in statistical and agricultural fields inside and outside of Hebei Province.

Keywords : Vegetable industry survey Sampling methods Table reporting system Instances

1. Introduction

Since 90's of the 20th century, a market-based economy is gradually instead of central-planned economy, growing variety components are reconstruction constantly, vegetables growing industry has been developed swiftly, sowing area is larger and larger, products quality is better and better. By the end of 2006, the national vegetable growing area is up to more than 20 million ha., and its output value up to more than 6,500 billion RMB also. Now vegetable sector has emerged as an important component of Chinese Economy. It has become a dominant industry of improving rural economy and increasing farmer's income.

The survey approach for vegetable industry is somewhat more complex (Jie jing Gu.(1995) due to its cultivation features such as miscellaneous planting ways, varieties, rotations, distinct regional features, transports and sales limitation, and greater differences in yield, cost and benefits,

etc. so our purpose is to study new sampling survey method and determine new indices which coincidence to current economy system and market environment for Chinese vegetable industry and serves the whole society.

Although the Government of China has reduced significantly its direct intervention in vegetable growing plan, nonetheless vegetable crops survey is still executing Overall Statistic Method (OSM) used in centrally-planned economy system. Sampling survey method for vegetable industry have not been officially adopted, OSM has lagged largely behind the development of social economy. With the establishment and development of market-based economy, the problems and disadvantages of OSM is becoming increasingly outstanding, it shows four aspects as follows:

Survey indices are extensive and unscientific. Total area and total yield from OSM usually are summed by all vegetable lager classes, lack of more subtle varieties classification; it brings about some problems such as statistic calculating confusing and survey errors increasing, totals indices have lost their guiding significance.

 Info lags. OSM conduct multilayer collecting statistics and hierarchical management, generating result needs long time. Information lags seriously.

 Great cost. As OSM concerns extensive statistic ranges, large workload, and excessive summarizing layers, it needs expensing larger manpower, material resources and financial resources, it brings about many difficulties to statistic business.

 Man-made intervene. Vegetable information is one of important indices measuring achievements for various levels government, all leaders of each layer usually pay more attention on it, all statistic results must be audited and authoring by current level supervisor before being reported to each superior government. It is easy to be intervened in some extents and bring about orientation errors.

All the above said strongly diminish the reliability of the vegetable survey data and possibilities of data analysis.

Besides the drawbacks of the OSM survey system itself, in the all existing researches to vegetable industry, nonetheless have no exercisable and institutional survey design in China. Studies concerning vegetable production and sales are quite fewer, no one has put forwarded a complete set of vegetable sampling methods adapting Chinese current status. Yueying Mu et al.(2006) studied vegetable circulation cost by enrolling investigation expenses by selecting random fixed stalls as samples, but their study can not accord with practices; Yujia Xie et al(2005) adopted tracking survey ways to collect data, improved the credibility of production and marketing benefit, but they pay more attention to behavior researches and its applying ranges is too narrow; Yanrui Shang et al. (2005) adopted typical survey ways to study production and marketing status of key vegetable growing village, but they layed emphasis on sales, deficient indices system, etc.. Therefore, it is necessary to develop sampling survey method adapt to new economy status and vegetable growing.

2. Sampling survey design

The study area lies in all scope of Hebei province administrative region, China. It lies in 113°11′-119°45′E, 36°05′-42°37′N. The total farmland area is 6,000,600 ha, and vegetable planting area is about 1,120,000 ha.。

Since 2002, we have started to design and apply a new vegetable crops sampling survey and reporting table system (VSS) based on scientificity, practicability, usability, anti-intervention and economy principles. In VSS we improved and innovated contents from six sectors including survey contents, sampling methods, indices establishing, coding, survey methods and estimation methods. Up to now we have practiced it for five years, made it to be perfect gradually, acquired good results in practices, approved by specialists of statistic and agricultural fields inside and outside of hebei

province.

2.1 Sampling survey principles

2.1.1 Scientificity

Firstly confirm accurately statistic scope, intensive vegetable classification. Existing vegetable crops are divided into three big classes(class-A) include open field vegetable, facility vegetable and plastic film covering vegetable according to planting ways, then classified every A-class to four kinds(class-B) include roots species, leave species，fruits species and Allium species. Secondly develop and execute 2-levels sampling method that is village samples are generated directly from city and farmer samples are generated from village, it can reduce sampling errors effectively. Thirdly improve survey method. OSM consists of 5 levels government these are province, city, county, town and village, it is excessively fussy and inaccurate. In the new method MSS, two levels of government statistic sectors from county and village are responsible for specified survey business, provincial government statistic bureau is responsible for estimating business, it can assure result authenticity (Cochran, W.G,1977; F. Y.Zhao,1994; Country Paper Georgia,(2005).

2.1.2 Practicality

The setting of various vegetable survey indices, macroscopically are all based on of insuring increasing farmer's benefits and providing basis for various levels of governmental officers, microcosmically are all based on providing classified vegetable production and sales data for relative departments, it is help of guiding vegetable growing.

2.1.3 Exercisable

Précise various vegetable indices meaning, seriously define survey scope, it is help of investigation personals operation(Tauqueer Ahmad, etc. 2006). Two levels of survey personals from county and village measuring area and vegetable yield directly, operation tools are simple and survey method is easy to be master, with the help of scientific computer estimation program, so it increases survey's operationabilty at large extent.

2.1.4 Intervention resistance

To resist falsity and insist truth, we try to avoid man-made interferences in all sampling and estimation process. Firstly, new method VSS avoids interference from city levels, because estimation program is executed at provincial level. Secondly, VSS avoids interference from two levels of county and town, as sampling data don't represent county and town sum. It is help of reflect practice status factually(Renda Zhang,1994).

2.1.5 Economizing

New method VSS control precision survey target, it can reduce factual sampling scope, shorten survey times, quicken survey speed, ensure each survey personals are trained professionally, therefore can avoid no necessary waste of manpower, material resources and financial resources.

2.2 Sampling design

2.2.1 Regard city as a sum, selecting village samples by MPPS method.

According to the factual status, firstly establish sampling frame using city sum, then select a set of village samples which can represent local vegetable current status as survey net sites,finally select farmer samples in every village sample. The specific steps are as follows: first all calculate the nearest three years averages indices include sowing area, unit yield, total yield and farmers number for all administrative villages of 11 cities in the whole province, then establishing sampling frame by all vegetable growing villages; adopt MPPS methods select villages to build survey Net sites(Changzhong Chen,1995).

2.2.2 Selecting farmer samples by symmetrical equal distance sampling method according vegetable area in village samples.

Firstly establish small sampling frame according vegetable's sowing area of last year for all

vegetable growers in each village sample (farmers who didn't plant vegetable don't take part in sort), then select representative growers by random begin symmetrical equal distance sampling method(Jiaoqi Li,1994).

2.2.3 Errors examination

Village samples and farmer samples must be examined for these sampling errors and representatives, include representatives examination of unit yield and average sowing area of one grower(Jiming Fang,1995). Both sampling errors and representative errors must be controlled within the scope of ±2%.

2.2.4 In multi-sets of allocated survey designs, select a set of design which include more key vegetable growing villages to apply as survey net sites.

2.3 Survey contents

To satisfied with the demands of guiding vegetable's production for relative departments, according to the vegetable industry status of planting scale, species, harvest time and farmers benefits, it is necessary to survey the three key aspects:ⅰ actual planting area and yield;ⅱ sales, cost and benefits; ⅲ planting ways and varieties structure.

In the same time we must divide the above three kind of survey contents to three levels of indices that is class-A, class-B (narratived in 2.1.1) and class-C(main vegetable species)(Jinzi Yan,1994). In the mean while we can survey some sales indices such as price, cost, sales amount and so on. Therefore, VSS can estimate actual vegetable output and income according to different harvest times and different specie's yields, reflect farmer's income more accurately(Baoli Zhou, 1995).

2.4 Indices setting

VSS improved and renewed OSM indices at larger extent, changed OSM pay attention only to vegetable growing status, it surveys production and sales of current vegetable status and estimates both yield and benefit.

2.4.1 Production indices are divided to three levels according to survey that is class-A, class-B, and class-C

2.4.2 Increasing sales indices, such as sales amount, sales outside of province, price, and so on

2.4.3 Increasing benefit indices, such as investment, charge, cost, income, etc

2.5Code

Firstly determine farmer samples' code referencing unified farmers codes of the second national agricultural census. Then classify and code for different indices to facilitated computer estimation, analysis and development. For major planting ways, vegetable species, and classifications unify code. Current major vegetable species is confirmed to 21, and the number can be increased or reduced with the reality and time. Planting ways is coded as 01 open field vegetable, 02 ground plastic film covering vegetable, 03 facility vegetable; classification is coded as 01 roots Species,02 leave Species,03 fruits Species,04 Allium Species,05 others.

3 Survey Method

3.1 Establishing vegetable log of yield and sales for farmer samples

All producing status such as yields, sales, investigation and earning of every field must be registered according to actual generating time by farmers. For farmer samples examine and measure vegetable area on field, establish production logs for different vegetable species, according to actual generation date record sowing area, harvest yields, sales, investigations, etc.

3.2 Record to computer

County survey personals and village personals supervise and direct farmer's logs, then collect, record and examine once a month and report up to provincial survey office once three months.

4 Estimation method

Provincial survey personals sum farmer samples' basal data by different cities according to design, estimate the whole provincial result and report it up to national office and share to social. Cities result feedback to every city.

As basal information is from farmer sampls' different vegetable species logs, VSS method can implement the estimation for different planting ways(class-A), different kinds(class-B) and different species(class-C) according to actual demands, make the survey result is of more value. The specific steps as follows:

ⅰ Determine the weights value of j city and i village(w_{ij});

ⅱ Estimate various averages indices of i village of j city (x_{ij});

ⅲ Estimate total indices of every city;

ⅳ Estimate total indices of the whole province (X).

$$X = \sum_{j=1}^{n}\sum_{i=1}^{m} (x_{ij} \cdot k_{ij} + x'_{ij}) \cdot w_{ij} \qquad \text{(formula (1))}$$

(1)

kij numbers of vegetable growers in No. i allocated village;

x'_{ij} numbers of cooperative vegetable growers in No. i allocated village;

5 Specified survey operation

5.1 Sowing area survey

5.1.1 Auditing and measuring area on field

Usually we audit and measure vegetable sowing area for farmer samples for each plot, (To increasing comparability of indices between facility vegetables and all other planting ways, we regard occupation land area of it as its sowing area), all measured plot data is recorded on log.

5.1.2 Estimating sowing area of farmers management

Based on audited measured area of all farmer samples, provincial personal can sum all survey data by computer and estimate sowing area of all farmer vegetable growing in one city.

5.1.3 Estimating total sowing area at city's level

Total sowing area at city's level=total sowing area of sampling parts of one city + total sowing area of vegetable grower organization bigger than village(gaining by survey)

5.1.4 Estimating provincial vegetable sowing area

Total vegetable sowing area= the sum of total area of 11 cities.

5.2 Yield survey

5.2.1 Yield survey method

Firstly establish different vegetable species log in allocated farmers, survey personal of village level record production indices of all plots to above logs by go into farmer's home, these include planting ways, kinds, yields, sales, costs, etc., survey personal of county level record above data to computer and report up to provincial office, finally provincial personal sum and estimate the result, in the same time data can be feedback to city office.

5.2.2 Yield estimation method

5.2.2.1 Total indices estimation

ⅰ Estimating farmer samples' unit yield. sum yields from all logs, calculate unit yield of this month, this season and this variety according to sowing area, then estimate the average unit yield of all varieties and all farmer samples by weighted average.

ⅱ Estimating total yield of all vegetable grower in of each village sample: unit yield average of farmer samples ×sowing area average of all farmer samples× vegetable grower numbers

ⅲ Total yield of a village samples: total yield estimation of vegetable growers+ vegetable growing organization total yield

ⅳ Average yield of village samples= total yield of a village sample/(sowing area average of one grower ×grower numbers+ vegetable growing organization sowing area)

v Total yield of vegetable grower organization bigger than village is investigated by various levels of statistic sector and report up level to level

vi Total yield of one city = average yield of village samples ×sampling part of sowing area + total yield of vegetable grower organization bigger than village

vii Estimating average unit yield at city level: average unit yield of a city= total yield of one city/sowing area of a city

viii Total yield of a province=yields sum of 11 cities.

5.2.2.2Classification estimation

Based on the production log, according to the regular code for different planting ways, kinds and species, so can retrieval, handle, and estimate some indices by some key words.

i Setting codes. province code set as 13; codes of city, county and village use two digitals according to agriculture censure code; farmer's name, planting ways, kinds and species order arrangement by 01,02, 03, ……respectively, the total code number is 16 bit(province code lies in 1st and 2nd; city code 3rd and 4th; county code 5th and 6th; village code 7th and 8th; farmer name 9th and 10th; planting ways 11th and 12th; classes 13th and 14th; varieties 15th and 16th). For example, code 1302210101030415 represents facility vegetable cucumber of the first farmer, first village, Fengrun county, Tangshan city, Hebei Province.

ii Estimating method. Based on the various basis data of production log, generate different information according actual demands. For instance, facility vegetable can be estimated by select code 03 in 11 and 12 code.

5.3 Cost and benefit survey

Register production and sales status of allocated farmers including seeds, fertilizer, medicine, facility, transportation, charge, sales amount, and other investigation, estimate cost and benefit.

i Cost of vegetable grower organization part =seed cost+ fertilizer cost+ medicine cost+ facility cost+ labor cost+ charge+ other cost

ii Unit income of vegetable grower organization part =(price ×total yield of vegetable grower organization part -investigation cost)/ sowing area of vegetable grower organization part

iii Investigation cost of farmer samples=seeds investigation +fertilizer investigation+ medicine investigation +facility investigation+ labor investigation +charge + other investigation

iv Unit income of farmer samples=(prices ×total yield of farmer samples-investigation cost)/sowing area of farmer symples

v Average income of village samples=weight average between unit income from farmer samples and unit income of vegetable grower organization part

vi Unit income at city level= weight average between unit income of village samples and unit income of vegetable grower organization bigger than village

vii Unit income at province level=weight average of 11 cities

6 Results

6.1 Develop a new innovation of benefit indices for vegetable statistical figure which can represent the general vegetable production status more scientific and more truthfully, improve the quality of survey result and enhance its value.

6.2 Determine sampling net site by using city data as a sample frame, can both meet the needs of classification administration and diminish sampling error induced by markedly differences on natural resources and production level.

6.3 Farmer samples establish production logs can precise survey indices, enhance availability, increase authenticity, and can develop deeply again for correlative information.

7 Conclusion

The study and application for sampling methods on vegetable industry in Hebei, China, gave a

whole monitor system for vegetable industry, and it can monitor the change and dynamic for vegetable production, provide a great number of timely and actual data and information for China statistic bureau and local government. Data information and analysis report from the study have participated in macro-decision of Hebei province government accepted affirmation from major directors of Hebei.

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