• National Food Security System Conceptualization and Economic Evaluation[1]

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Abstract

This study conceptualized the National Food Security System or NFSS as a computer-based food security early-warning and mitigating system. NFSS is composed of a Geographic Information System or GIS-based software supported with huge databases and computer hardwares. Its job is to ensure any country's sufficiency on basic food commodities such as rice, corn, sugar, meat and other products through sound resource and marketing management. It uses projection methods and mitigating techniques reviewed and approved by panels of experts in the country of application. It can be stationed at any central location but requires regular input of local data from all locals, such as provinces, states, etc. sent through Internet formatted e-mails preferably or any other communication means. The system requires local data on (1) climatological disturbances and abnormalities, (2) relevant disasters, (3) crop, food imports/exports and related data, (4) reports on food hoarding, smuggling and related crimes, and (5) feedback information to the system. As outputs, the system can generate any time for the entire country and all localities (1) the food production surplus/shortage projections, and (2) applicable food shortage mitigating measures, if any. This study also evaluates the economic feasibility of NFSS application in the Philippines. Analysis indicated that the use of NFSS has a Net Present Value of P2,160,974,503 (P40/US$1) in 15 years of operation with Internal Rate of Return of 5,704%, Benefit-Cost Ratio of 31.98 and payback period of less than four months. The above results were based on an investment of P2,468,290, base year operating cost of P5,793,550 and assumed monthly government savings on food-related expenditures of P1,000,000/region. Furthermore, the system was projected to increase food productivity and reduce incidence of sickness, deaths, price escalations, sedition, crimes and other social instabilities directly and indirectly caused by food insufficiency. Sensitivity analysis reveals that the system is still economically feasible even if the resulting monthly government savings is a slow as P40,000 per region. Based on the results, it is concluded that NFSS application in the Philippines is economically feasible.

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[1] Adjudged Best paper during the 49th Annual Convention of the Philippine Society of Agricultural Engineers (PSAE) held at Family Country Hotel and Convention Center, Mateo Road, General Santos City, Philippines, 26-30 April 1999.

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INTRODUCTION

Food security is one basic requirement for a country's economic stability. Without it, many social problems and instabilities can be directly and indirectly caused. Hence, it is now a priority program of the Philippine government. National food security is a big task to cope with; however, with the advances in computers and telecommunications, this task could be easily addressed. Specifically, it could be easily handled with the use of GIS, since the job is wide in coverage and geographical in nature.

The use of GIS had its drawbacks. GIS is a sophisticated software and requires well-trained manpower, otherwise it could lead to the failure of the envisioned food security system. But it is in this field in which the Philippines has skilled human resources. As cited by Macatual (1993) based on the reports of NAMRIA (1991), Aviquivil (1992) and Rodriguez (1992, the Philippines is one of the pioneers in the development and application of GIS. The same author also cited that, as early as 1974 when the generic term *GIS* was still unknown, a raster-based prototype GIS model – Computerized Land Assessment and Planning System (CLAPS) – had been developed and used for landuse planning and environmental assessment, particularly in Boso-boso and Dumaguete City. Besides being sophisticated, GIS is also expensive, which makes itself less attractive in terms of economic viability. However, GIS can be highly economically viable if its use is maximized (Tambong, 1997).

From the above context and drawbacks, a national Food Security System was conceptualized and evaluated for economic feasibility in the Philippines.

Objectives of the Study

The study aims to conceptualized and evaluate the economic feasibility in the Philippines of a national Food Security System based on an assumed monthly government savings on food and food-related expenditures of P1,000,000 per region. Furthermore, this study aimed to analyze the sensitivity of the system's economic feasibility at lower rated of government savings on food and food-related expenditures.

METHODLOGY

System Conceptualization

The system was conceptualized based on the prevailing food insufficiency problems of many countries, the problem's known root causes and contributory factors, and the available tools and methods for solving the problems.

Data and Assumptions

Based on current market prices, the data on cost of GIS software, hardwares and office supplies were gathered. Cost data on salaries were determined based on the standard government rates. As benefit obtained out of the system, monthly government

savings on food and food-related expenditures of P1,000,000 per region on the average, was assumed for the main feasibility analysis. All other costs and economic data were estimated.

Feasibility Analysis

Employing the life cycle cashflow accounting, the economic feasibility indicators were quantified: (a) Net Present Value, (b) Internal Rate of Return, (c) Benefit-Cost Ratio, and (d) payback period. The overall economic feasibility of the system was determined based on the resulting values of the feasibility indicators.

Bytex Feasibility Analyzer (Release 1.2), a software for analyzing economic and financial feasibilities of any project, was used in the analysis..

Sensitivity Analysis

The sensitivity of the feasibility of the system to the level of monthly benefit was analyzed. This was done by gradually lowering the value of monthly benefit and quantifying the different feasibility indicators until the system was rendered infeasible.

RESULTS AND DISCUSSION

Economic Feasibility

Economic analysis (Appendix A) reveals that the system is very much feasible at an assumed benefit or monthly government savings on food and food-related expenditures of P1,000,000 per region. This is indicated by the following results: (a) the Net Present Value is not negative, (b) the Internal Rate of Return is above the assumed opportunity cost of investment resources of 9.5%, (c) the benefit-Cost Ratios is above 1.0, and (d) payback period is less than the assumed longest acceptable payback period of 5 years.

Sensitivity to Amount of Benefit

The system's economic feasibility was found to be sensitive to level of benefit derived. The higher the benefit derived the more feasible is the system and vice versa. Sensitivity analysis also revealed that it is feasible even at very low level of benefit. As shown in the sensitivity analysis section of Appendix A, the system is still feasible even at a resulting monthly government savings of only P40,000 per region.

CONCLUSION

Based on the results of the study, it is concluded that application of the conceptualized National Food Security System (NFSS) in the Philippines is economically feasible.

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Appendix A

FEASIBILITY ANALYSIS OF THE NATIONAL FOOD SECURITY SYSTEM

(Analyzed Using the Bytex Feasibility Analyzer, Release 1.2)

Project title	:	National Food Security System
Location	:	Dept. of Agriculture, Quezon City, Philippines
Monetary unit used	:	Thousand Pesos (P40/US$1)
Main product or output	:	savings in government expenditures
Unit of main output	:	Thousand Pesos
By-products	:	None
Implementor	:	Department of Agriculture, Philippines
Cooperating agencies	:	PAGASA, NDCC, NFA, PNP, and related agencies
Funding agency	:	Department of Agriculture, Philippines

ECONOMIC ANALYSIS

Year	Investment (000 P)	O&M Cost (000 P)	Total Cost (000 P)	Benefit (000 P)	Net Cash Flow (000 P)
0	2468.29	0.00	2468.29	0.00	-2468.29
1	0.00	4345.16	4345.16	144000.00	139654.84
2	0.00	6372.91	6372.91	211200.00	204827.10
3	0.00	7010.20	7010.20	232320.00	225309.80
4	0.00	7711.22	7711.22	255552.00	247840.78
5	0.00	8482.34	8482.34	281107.20	272264.86
6	0.00	9330.57	9330.57	309217.92	299887.35
7	0.00	10263.63	10263.63	340139.71	329876.08
8	0.00	11289.99	11289.99	374153.68	362863.69
9	0.00	12418.99	12418.99	411569.05	399150.06
10	0.00	13660.89	13660.89	452725.96	439065.07
11	0.00	15026.98	15026.98	497998.55	482971.58
12	0.00	16529.67	16529.67	547798.41	531268.73
13	0.00	18182.64	18182.64	602578.25	584395.61
14	0.00	20000.91	20000.91	662836.07	642835.17
15	-114.53	22001.00	22001.00	729119.68	707233.21

Net Present Value (NPV), Thousand Pesos	2,160,974.503
Internal rate of Return (IRR), percent	5,703.705
Benefit-Cost Ratio (BCR)	31.978
Payback Period, years	0.264
Remarks: Economically Feasible	

SENSITIVITY ANALYSIS

Monthly Government Savings (Million P/region)	NPV (Million P)	IRR (%)	BCR	Payback (Years)	Remarks
1.000	2,160.974	5,703.7	31.98	0.26	Feasible
0.500	1,045.607	2,785.8	15.99	0.26	Feasible
0.250	487.924	1,325.4	7.99	0.28	Feasible
0.100	153.314	444.8	3.19	0.34	Feasible
0.050	41.777	143.1	1.60	0.55	Feasible
0.030	-2.837	-	0.96	-	Not Feasible

Appendix B

ASSUMPTIONS, COST AND BENEFIT DATA USED IN THE FEASIBILITY ANALYSIS

(Costs and Benefits in Thousand Pesos, Exchange Rate at P40/US$1)

SUMMARY OF DATA AND ASSUMPTIONS

Initial investment cost	2,468.290
Base year operation & maintenance cost	5,793.550
Base year benefit per unit output	192,000.000
Salvage value, % of initial investment	4.640
Discount rate, %	12.000
Opportunity cost of investment resources, %	9.500
Project establishment period, years	0.250
Economic life, years	15.000
Longest acceptable payback period, years	5.000
Equity, % of initial investment	100.00
Annual growth rate of O&M cost, %	10.000
Annual growth rate of benefit per unit output, %	10.000

DETAILS OF INITIAL INVESTMENT

Description	Amount
MapInfo (GIS) Software	90.000
2 Global Positioning System	160.000
2 Pentium II Computers	120.000
Plotter	120.000
Color Inkjet Printer	8.500
Digitizer	30.000

Dataswitches, UPS, Surge Protector	17.000
Software Development & Training	250.000
Operating Capital (25% of Base-year OM)	1,448.400
Miscellaneous/Contingency (10% of Investment Cost)	224.390

DETAILS OF ANNUAL OPERATION & MAINTENANCE

Description	Amount
Salaries (3 full-time personnel)	650.000
Data gathering (P25,000/region monthly)	4,800.000
Office Supplies	72.000
Communications	120.000
Electricity	6.000
Repair & Maintenance (10% of Hardware Cost)	45.550
Miscellaneous	100.00

DETAILS OF BENEFITS OR REVENUES

Description	Amount
Govt. Savings on food & food-related expenditures	192,000.000