Chapter - **12**

Decision Support System for Farm Entrepreneur: A Logistic Approach

NISAGENET lays emphasis on providing a unified information system on various activities of the agricultural universities, which includes collection, compilation and analysis of information about the activities of the agricultural universities. The system is capable of maintaining an up-to-date agricultural education data bank of all SAUs and Deemed Universities of ICAR and providing answers to assessment of agricultural education related queries covering aspects like characteristics of agricultural universities/institutions, teaching programmes offered, infrastructural facilities and funds available in different universities. It also contains information on manpower distribution, research and technological developments in the universities.

NISAGENET System contains data with regard to Academics, Infrastructural Facilities, Budget provisions, Manpower employed, Personal Information of the faculties and the Research and Development activities in the 61 Agricultural Universities involved in imparting higher agricultural education in India. The system is dynamic in nature and the data need to be updated regularly to provide up to date Information to the user's community.

The system acts as a decision support system and has been quite useful to academicians, scientists and technologists in planning their research and technological activities; to planners and policy makers in having an overview of

teaching, training, research activities for providing appropriate funding for uplifting the existing facilities; to students for undergoing higher education in agriculture, and to other related individuals and institutions.

National Statistics Commission (NSC) and the Department of Secondary & Higher Education of the Ministry of Human Resource Development, Government of India desired that a national information system on agricultural education be prepared for various policy and planning purposes in the country. To implement these recommendations, the Indian Council of Agricultural Research (ICAR) approved this project under its AP Cess Fund Scheme for a period of three years (01-01-2005 to 31-12-2007). The project was executed by the Indian Agricultural Statistics Research Institute (IASRI), New Delhi as the Lead Center having collaboration with 42 participating organizations that includes SAUs - 34, ICAR DUs - 4, AAIDU - 1, Central Universities – 2 (AMU & BHU) and the Central Agricultural University, Imphal.

The National Information System on Agricultural Education Network in India (NISAGENET) portal is being maintained at the Central Server of IASRI, New Delhi and is accessible at http://www.iasri.res.in/Nisagenet/ to provide Country /State/ University/ College level reporting on agricultural education in India.

In view of the importance of NISAGENET, ICAR has made it to maintain as a regular ongoing activity of the ICAR and it is mandatory for all the SAUs, AUs, Central Universities and Deemed Universities of ICAR to participate and provide the data as per requirements of this system. The organisational set up of the system is as follows:

- Education Division of ICAR, New Delhi - as Coordinating Unit
- IASRI, New Delhi – as Lead Centre
- *All 61 SAUs/Deemed Universities of ICAR/CAUs - having a NISAGENET Cell at each organization

In order to provide realistic and up-to-date reporting through NISAGENET, it is essential to update and validate the existing data and regular updating from all the Agricultural Universities along with their constituent/affiliated colleges is equally important for providing Country/State/University/College level reporting from the system.

The architecture of NISAGENET has been structured so that the participating organizations are able to have direct access to IASRI Central Server for updating / uploading the data of their respective university/colleges. For Data Management secured User Id and Passwords have been made available to all the universities.

The Nodal officers at each university are responsible for providing data to NISAGENET. However the activity may be shared by officials at different constituent/affiliated colleges of the university. The Nodal Officer can generate User Id and Password for each college and data can be updated directly from a college to the central server. Nodal Officers responsibility includes:

- Collection and compilation of the data from all the affiliated Departments /Sections of the University and Affiliated/Constituent Colleges.
- Reliability of the Quality and Quantity of the data entered into the system
- Regular data entry/updating to NISAGENET Central Server

2. Data requirements of NISAGENET

- One time data entry and validation
  - University/College basic data
  - Academic Programs/Infrastructure
- Event based data updating
  - Change of VC/Dean
  - Retirement/Promotions
  - Addition of new disciplines etc.
- Operational Data Entry & Verification

- Students Enrolment/Pass out under various disciplines
- University Manpower data
- Budget etc.

(Targets need to be maintained for operational data entry)

3. Information Base of NISAGENET

The Information Base of NISAGENET is comprises of all the activities of Agricultural Universities. For relevant data collection and compilation, the activities have been classified into following 6 schedules:

i. Academic Information   - Schedule - I
ii. Infrastructural Facilities - Schedule - II
iii. Budget Information   - Schedule - III
iv. Manpower Information - Schedule - IV
v. Faculty Profile   - Schedule - V
vi. R&D Activities   - Schedule - VI

i. Academic Information Schedule – I covers General Information About Universities & its Colleges; Details About Administrative Heads; Disciplines of UG/ PG Programs; Strength of Students; Training Programs Organized; Mode of Admissions; Scholarships / Reservations and Placement Cell.

ii. Infrastructural Facilities: Schedule - II covers laboratory Facilities; Major Equipments and Machineries; Lecture Rooms; Sports/Cultural Facilities; Library Facilities; Medical Facilities; Hostel/Guest House Facilities.

iii. Budget: Schedule – III covers Receipts from Different Sources; Source-Wise Income of University; Allocation of Funds; Details of Budget Expenditure

iv. Manpower: Schedule – IV covers, Gender wise, Category wise, Sanctioned, In Position & Vacant Status of Faculty Members; Status of Technical Staff; Status of Administrative Staff; Status of Supporting /Auxiliary Staff.

v. Faculty Profile: Schedule – V covers, Background Information of Faculty; Academic Details; Service Particulars; Training Programmes Attended; Publications; Agri. Varieties / Packages of Practices Developed and Awards and Achievements.

vi. R&D Activities: Schedule – VI covers, Ongoing Research Projects; University Academic Achievements; University R&D Activities; Workshops Organized; Seminar/Conferences; Summer/Winter Schools; Field Demonstrations; Women Training Programs; Kisan Melas; Adhoc Training; University Publications and Technologies Developed.

4. Operational Architecture of NISAGENET

As per the earlier architecture, Data Base Management module was distributed over the Local servers of the respective universities. Upload facility was provided for detail data entry, updating and uploading of modified data from the Local Server to the Central Server. Finally, the data received from Local Servers had been integrated with the database of Central Server and country/state/university/college level reporting was provided from the central server.
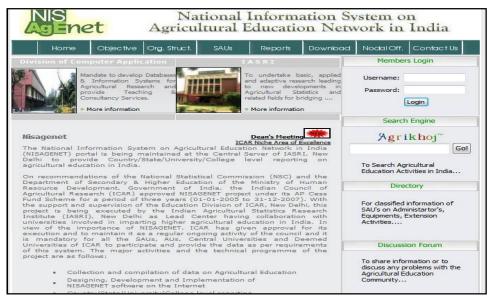
In the present modified architecture, the concept of Local Server has been eliminated from the NISAGENET system. For data entry, updating and upload of modified data from a university/college, direct access to Data Management Module of NISAGENT from the Central Server has been provided and consequently:

- Independent User Id and Password have been provided to Nodal officers and other class of users

- The Nodal Officers will have direct access to Data Management Module of their respective University/Colleges

- A facility to the Nodal Officer(s) is provided to create User Id and Password for their respective affiliated/constituent colleges.

- Independent data entry is made possible from a college by using respective User Id and Password.

5. Homepage of NISAGENET

The Homepage of NISAGENET is activated by executing http://www.iasri.res.in/Nisagenet/ in the URL of Internet Explorer.

The home page contains tabs namely Home, Objectives, Organization Structures, SAUs, Reports, Download, Nodal Officers, Contact Us, Search Engine Agri Khoj, Directory, Discussion Forum and Latest News etc. The NISAGENET at the Central Server has been broadly categorized for the following facilities.

- Query/Reports system at Country, State, University and College levels

- Search Engine – Agri Khoj

- Directory Search for Administrators, Faculty, Equipments and Extension activities
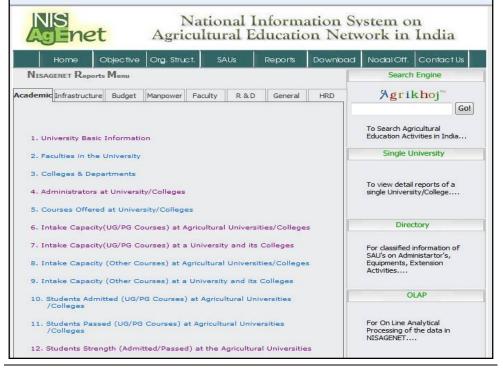
- Discussion Forum

- Database Administration at Central Server

- Data Management of all the participating organizations

- Download facility for updated latest version of the Data Management Application Software for the Local Servers

- Facility for integrating updated data sent from the universities to Central Server at IASRI, New Delhi

- Data Management of other colleges offering agricultural education and are affiliated to other Central Universities.

5.1 Reports/Queries

On clicking of the Reports tab of home page, system provides facility to generate state/districts/university/college level reporting for the users. NISAGENET Reporting Capabilities includes:

- Agricultural Universities – Affiliated /Constituent Colleges

- University/Colleges Distribution on the Basis of Location

- State-wise Distribution of SAUs/Colleges

- Faculty Members status in SAUs/Colleges

- State-wise Enrolment in SAUs/Colleges

- Enrolment in different Disciplines i.e. Veterinary Science

- State-wise Distribution of Passed Out Students in a Academic Year

- Intake capacity of SAUs in different disciplines

- Annual Budget of the SAUs

- Annual Expenditure of the SAUs

- Faculty Status in Agricultural Education

- Technical/Administrative Manpower

- Existing Manpower Gender and Category wise

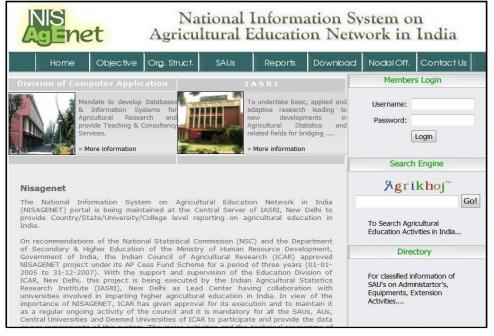- Sanctioned, Existing and Vacant Cadre Strength

- Admissions Criteria
- UG/PG Courses available at SAUs
- Scholarships at University/Colleges
- Major Equipments available
- Hostel/Guest House Facilities
- Student Welfare and Supporting Services
- Individual Faculty Member(s) Details
- Designation/ Discipline Wise Faculty Strength
- Faculty Members with Awards and Achievements
- University/Colleges R&D Activities
- Ongoing Research Projects from Different Funding Agencies
- Research Extension Centres in Universities /Colleges
- And many more................

5.2 **Data Management Component - Member Login**

To Login into the NISAGENET use http://www.iasri.res.in/Nisagenet and NISAGENET website will open in your browser.
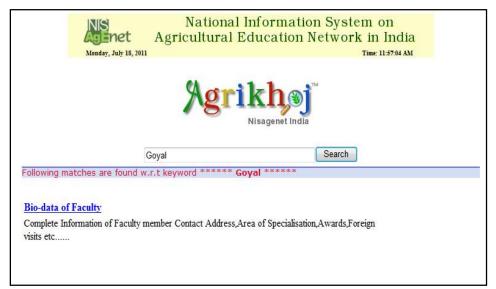

On the right side Member Login option is visible. User can login to NISAGENET by using their respective 'University' User Id and Password.

After entering User id and Password, click on login button. Then new window will appear. When user enters using their respective University User id and Password, then the data management activities related to the University and its constituted/affiliated Colleges can be undertaken by concerned Officials.

5.3 **Agrikhoj Search Engine**

In contrast to other search engines, Agrikhoj search engine has been designed to search information about Agricultural Education in India. This search engine allows one to search documents for specified keywords specific to agricultural education research and hence retrieving a list of references that match those

criteria. Agrikhoj search engine use regularly updated indexes to operate quickly and efficiently. The mission statement of Agrikhoj is to 'Organize the India's agricultural education related information and make it universally accessible and useful'. Its scope is limited to NISAGENET.

6   Conclusion

The universe of concern with respect to NISAGENET is consisting of phase activities with regard to agricultural education system in our country. The system is capable of maintaining an up-to-date agricultural education data bank and has been an effective solution for collection and compilation of data on various technical programs in the field of agriculture research, teaching and training in India. The system acts as a decision support system and is quite useful to academicians, scientists and technologists in planning their research and technological activities; to planners and policy makers in having an overview of teaching, training, research activities for providing appropriate funding for uplifting the existing facilities; to students for undergoing higher education in agriculture, and to other related individuals and institutions.

Decision Matrix Definition

A *decision matrix* allows decision makers to structure, then solve their problem by:

1. *Specifying* and *prioritizing* their needs with a list a criteria; then

2. *Evaluating*, *rating*, and *comparing* the different solutions; and

3. *Selecting* the best matching solution.

As is, a decision matrix is a decision tool used by decision makers as part of their *Decision-Support Systems* (DSS) toolkit. It's a tool that acquirers use to address requirements that an acquisition plan template worthy of the name defines for selecting the contractor best matching their needs, as part of the acquisition life cycle. In the context of *procurement*, which is the solicitation and selection process enabling the acquisition of goods or services from an external source, the decision matrix, also called *scoring matrix*, helps determine the winning bid or proposal amid all those sent in response to an invitation to do so that, depending of the best-suited solicitation process, could either be a:

• Request for Proposals (RFP),

• Invitation for Bids (IFB),

• Invitation to Bid (ITB), or

• Invitation to Tender (ITT).

A *decision matrix* is basically an array presenting on one axis a list of *alternatives*, also called *options* or *solutions* that are evaluated regarding, on the other axis, a list of *criteria*, which are *weighted* dependently of their respective importance in the final decision to be taken. The decision matrix is, therefore, a variation of the 2-dimension, *L-shaped matrix*. The decision matrix is an elaborated version of the *measured criteria technique* in which options are given, for each criterion, satisfactory or compliance points up to a maximum (usually from 0 to 100) that is predefined per criterion and may vary between criteria depending on its relative importance in the final decision.

The *Decision Matrix* is also called:

- AHP matrix

- *bid decision matrix*

- *comparison matrix*

- *decision alternative matrix*

- *evaluation matrix*

- *government decision matrix*

- *importance vs. performance matrix*

- *measured criteria technique*

- *opportunity analysis*

- *performance matrix*

- *rating grid*

- *scoring matrix*

- *vendor comparison decision matrix*

- *weighted criteria matrix*

Decision Matrix Activity:

Should you be involved in creating a decision matrix, here is the activity you will be engaged in. Use the COWS method, shown below, that describes all the information you should come up with in order to make an impartial decision:

C   *Criteria.*
     Develop a hierarchy of decision *criteria*, also known as *decision model*.
O   *Options*.
     Identify *options*, also called *solutions* or *alternatives*.
W   *Weights*.
     Assign a *weight* to each criterion based on its importance in the final decision.
S   *Scores*.
     Rate each option on a ratio scale by assigning it a *score* or *rating* against each criterion.

Decision Matrix Example:

For our *decision matrix example*, let's consider the information below. Let's say we've identified criteria C1, C2, and C3 playing a role in the final decision, with a respective weight of 1, 2, and 3. Moreover, we've found 3 prospective providers A, B, and C, whose offer may constitute a good solution.

Creating a decision matrix:

It's critical to rate solutions based on a *ratio scale* and not on a *point scale*. For instance, the ratio scale could be 0-5, 0-10, or 0-100. Should you feel you must use a point scale (for instance, maximum speed, temperatures, etc.), you must then convert rating values on a ratio scale by assigning the maximum ratio to the estimated maximum value, which could be, for instance, 5 (for a 0-5 scale), 10 (0-10), or 100 (0-100). Indeed, a point scale with high values introduces a bias even if it's of less importance in the final decision. We've laid out the information into a 2-dimension, L-shaped decision matrix as shown below, and then compute the scores for each solution regarding the criteria with the formulas below:

Score = Rating x Weight and then

Total Score = SUM (Scores)

The result is the following: Scenario #1

		ALTERNATIVES					
		Option A		Option B		Option C	
CRITERIA	Weight	Rating	Score[1]	Rating	Score[1]	Rating	Score[1]
Criterion C1	1	3	3	3	3	3	3
Criterion C2	2	2	4	1	2	2	4
Criterion C3	3	1	3	3	9	2	6
Total	6	4	10	7	14	7	13

[1] Score = Rating * Weight

For a better interpretation, we can visualize the data in histograms. To do so, let's consider, as the data source, the *ratings* and *scores* of evaluated solutions. Here is the result:

	Option A (4)	Option B (7)	Option C (7)		WEIGHTS:		Option A (10)	Option B (14)	Option C (13)
	R1	R1	R1				S1	S1	S1
	R2	R2	R2				S2	S2	S2
	R3	R3	R3		W1 = 1		S3	S3	S3
	SOLUTION RATINGS				W2 = 2 W3 = 3		SOLUTION SCORES		

Solution Ratings:

When we sum up the ratings, both solutions B and C are equivalent and outperforming solution A, while similar globally, options B and C present different intrinsic strengths and weaknesses. Indeed, option B is better than option C for the criterion C3, but weaker on C2, while option C distribute more evenly its forces. Therefore, Option B is usually called a *best-of-breed solution*, while Option C is a typical *suite* or *integrated solution*. Let's apply the weights to the ratings now to obtain the...Solution Scores

While both options B and C were initially equivalent rating-ly speaking, weights applied to their ratings exacerbate the strength of option B in criterion C3. Indeed, a higher weight was applied to its strength and a lesser to its weakness, resulting in a first place. In this particular context, the better the solution breed, the higher rank the solution gets.

We have here an interesting example of a battle opposing two alternatives at first sight equivalent, but one showing an explicit, differentiated strength against another solution seeming spreading its strengths more evenly. Extrapolated, this battle is also called:

- The One versus The Best
- All-in-One versus Best-of-Breed
- Suite versus Best-of-Breed
- Best-of-Breed versus Integrated solutions

To solve this dilemma, there's no answer. Rather, the answer is "It depends". Indeed, depending on the contextual needs, one kind may be selected over the other. But, whatever the path chosen, the decision matrix won't be of any help in this matter but raising the concern. You will have to decide what's best for your organization's future. You could even build a meta decision matrix to help you answer this question...

Let's take a look at what would happen should your priorities change, and then find out the...

Importance of weight distribution in the final decision:

In order to discuss about the relative importance or effectiveness of weights coupled with ratings in the final decision, let's use the same aforementioned example and play with the weights, given the ratings won't never change.

In the first scenario, the weights were distributed as 1, 2, and 3 respectively for criterion C1, C2, and C3. Let's increase the second weight from 2 to 3. Here is the result: Scenario #2

	ALTERNATIVES							
	Option A	Option B	Option C					
CRITERIA	Weight	Rating	Score (1)	Rating	Score (1)	Rating	Score (1)

Criterion C1	1	3	3	3	3	3	3
Criterion C2	3	2	6	1	3	2	6
Criterion C3	3	1	3	3	9	2	6
Total	7	4	12	7	15	7	15

(1) Score = Rating * Weight

		Option B Option C (15) (15)
		Option A (12) C1 C1
		C1 C2
Option B Option C (7) (7)		C2
Option A (4)		
R1 R R1	WEIGHTS:	C2
R2 R2		C3
R3 R2	W1 = 1	C3
	W2 = 3 (+1)	C3
R3 R3 R3	W3 = 3	C3
SOLUTION RATINGS		SOLUTION SCORES

Solution Ratings

Based on an initial, fair, and impartial evaluation, the ratings don't change since solution capabilities remain the same. In some cases -we hope there're rare-, evaluators may be tempted to change the ratings to give a favor to a so-illegitimately selected solution.

Then we obtain the new...
Solution Scores

Because they are globally equivalent in their ratings, and given identical weights, both options B and C are now *ex aequo*. But, still, as you may notice, their internal differences remain.

Now, let's keep the second weight at 3, and decrease the third from 3 to 2. Here is the result:

Scenario #3

ALTERNATIVES

		Option A		Option B		Option C	
CRITERIA	Weight	Rating	Score[1]	Rating	Score[1]	Rating	Score[1]
Criterion C1	1	3	3	3	3	3	3
Criterion C2	3	2	6	1	3	2	6
Criterion C3	2	1	2	3	6	2	4
Total	6	4	11	7	12	7	13

[1] Score = Rating * Weight

				Option A (11)	Option B (12)	Option C (13)
	Option B (7)	Option C (7)			C1	C1
Option A (4)				C1	C2	C2
R1	R	R1	WEIGHTS:	C2		
R2	R2	R2	W1 = 1		C3	C3
R3	R3	R3	W2 = 3 (+1)	C3		
			W3 = 2 (-1)			

SOLUTION RATINGS   SOLUTION SCORES

Solution Ratings

Ratings still don't change, since the solution features and benefits are the same. Now, let's keep the second weight at 3, and decrease the third from 3 to 2. As a result, these are the new...

Solution Scores:

While both options B and C were initially equivalent rating-ly speaking, the new weights applied to their ratings inhibit what appeared to be a strength for option B in criterion C3. Indeed, a lesser weight was applied to its strength and a higher to its weakness, resulting in losing the first place in favor of option C. In this particular context, the more integrated the solution, the better its rank is.

Conclusion
Here is a recapitulation of the three scenarios with their respective weights:

B (14) C (13)	B C (15) (15)	C
A (10) C1 C1	A (12) C1 C1	B (12) A (11) C (13)
C1 C2 C2	C1 C2 C2	C1 C1 C1
C2 C3 C3	C2 C3 C3	C2 C2 C2
C3	C3	C3 C3 C3
Weights:	**Weights:**	**Weights:**
W1 = 1	W1 = 1	W1 = 1
W2 = 2	W2 = 3 (+1)	W2 = 3 (+1)
W3 = 3	W3 = 3	W3 = 2 (-1)

So, be careful in your interpretation of the result you get using a decision matrix. Indeed, you have to question the validity of the path you took to reach the conclusion you found. To challenge each step of your decision cycle, some features like *sensitivity analysis* and *robustness analysis*are helpful.

Decision Matrix: Analysis of Decision Making Process

FREE Decision Matrix Template and Example

Decision matrix template in *Microsoft Excel (MS Excel)*

A *decision matrix template* and a *decision matrix example* are provided in your FREE RFP Toolkit. The decision matrix template is a *Microsoft Excel* spreadsheet that you customize based on your needs (criteria vs. alternatives). Thus it becomes a *business object* you can use not only in your RFP evaluation process -which would be better called proposal evaluation process- but, more generally, in any *decision-making cycle*.

The *MS Excel* decision matrix template spreadsheet contains, in fact, two worksheets:

1. A decision matrix example worksheet,
2. A decision matrix template worksheet.

Both Excel decision matrix template and example can be opened with any *MS Excel*-compliant application.

You will also find in your FREE RFP Toolkit, amongst others, templates and samples of *RFP letters*, including:

- RFP cover letter, proposal cover letter
- No-bid letter
- Disqualification letter
- Rejection letter
- non-binding letter of intent
- Decision matrix template
- Protest letter

- Letter to decline a proposal
- Contract award letter

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