An Introduction to The Project:

APPLICATION ENGINEERING OF AGRICULTURAL EXPERT SYSTEM (AES) IN CHINA

中国电脑农业

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BACKGROUND（背景）

Problems faced China in Rural Development(RD)

中国农村发展面临的重要问题

- **Short of cultivated land resources and water**
- **Environmental pollution caused by unreasonable use of fertilizer and pesticide**
- **High agricultural production cost and low benefit**
- **Farmers face the Challenges from WTO.**

BACKGROUND （背景）

IT as a tool to give a solution for RD

信息技术为农村经济发展提供了有效工具

- **To transfer agricultural technology**
- **Help farmer to adopt the market**
- **Enhance the level of Decision-making for production&management , increase the yield, decrease the cost and pollution.**
- **Increase the income of farmers**
- **Improve the traditional Agri.by IT**

BACKGROUND （背景）

The IT Foundation for RD in China

中国在信息技术设施方面具有一定基础

- **The basic information facility&installation improved**
- **Concerned counties, villages and towns, and also in sweeping farms with a certain condition and specialized farmers have installed Computers.**
- **Many Agricultural & IT experts**
- **The approaches provided much more tech. support**
- **Having a party of extension workers with the combination knowledge both in agronomy & IT.**

BACKGROUND（背景）

Tab. 1 the agricultural website of China(1999-2000)
中国农业网站建设情况（1999-2000）

	1999	2000	Increase %
Web related agri.	500	1200	240
Agri Web	150	539	360
Government Organization for ag.	12	41	341
Ag.Institute	22	87	395
Ag.university	26	69	265
Ag.company	90	163	181
Total		2198	

BACKGROUND （背景）

Tab. 2 the agricultural website of some countries(1999-2000)

Order	Country	Ag. Web SITE	Order	Country	Ag. Web SITE
1	INDIA	5767	8	SPAIN	541
2	UK	4009	9	MEXICO	533
3	USA	3900	10	Argentina	530
4	JAPAN	2364	11	Brazil	422
5	CHINA	2198	12	CANADA	335
6	FRANCE	1282	13	PAKISTAN	163
7	ITALY	1075			

BACKGROUND

The China government pay more attention for IT in RD（中国政府部门关注农村信息技术的发展）

- **To set up the plan for IT in RD**
- **To invest more to improve the information facility**
- **to carry out projects of IT in RD both in the different national program and the province local program**

BACKGROUND（背景）

What is the AES（关于电脑农业）

AES: Application Engineering of Agricultural Expert System (AES), one important project of National High-Tech R&D Program (NHTRDP) of China.

- **AES is being carried out from the early 1990 till now, about 21provinces to implement**

BACKGROUND

What is an Expert System?（关于农业专家系统）

An Expert System (ES), also called a Knowledge Based System (KBS), is a computer program designed to simulate the problem-solving behavior of an expert in a narrow domain or discipline.

In agriculture, expert systems unite the accumulated expertise of individual disciplines, e.g., plant pathology, entomology, horticulture and agricultural meteorology, into a framework that best addresses the specific ,on-site needs of farmers. Expert systems combine the experimental and experiential knowledge with the intuitive reasoning skills of a multitude of specialists to aid farmers in making the best decisions for their crops.

BACKGROUND

***Chinese farmers need Agricultural Expert Systems to support*（中国农民需要农业专家系统支持）**

Agricultural production has evolved into a complex business requiring the accumulation and integration of knowledge and information from many diverse sources. In order to remain competitive, the modern farmer often relies on agricultural specialists and advisors to provide information for decision making. Unfortunately, agricultural specialist assistance is not always available when the farmer needs it. In order to alleviate this problem, expert systems were identified as a powerful tool with extensive potential in agriculture.

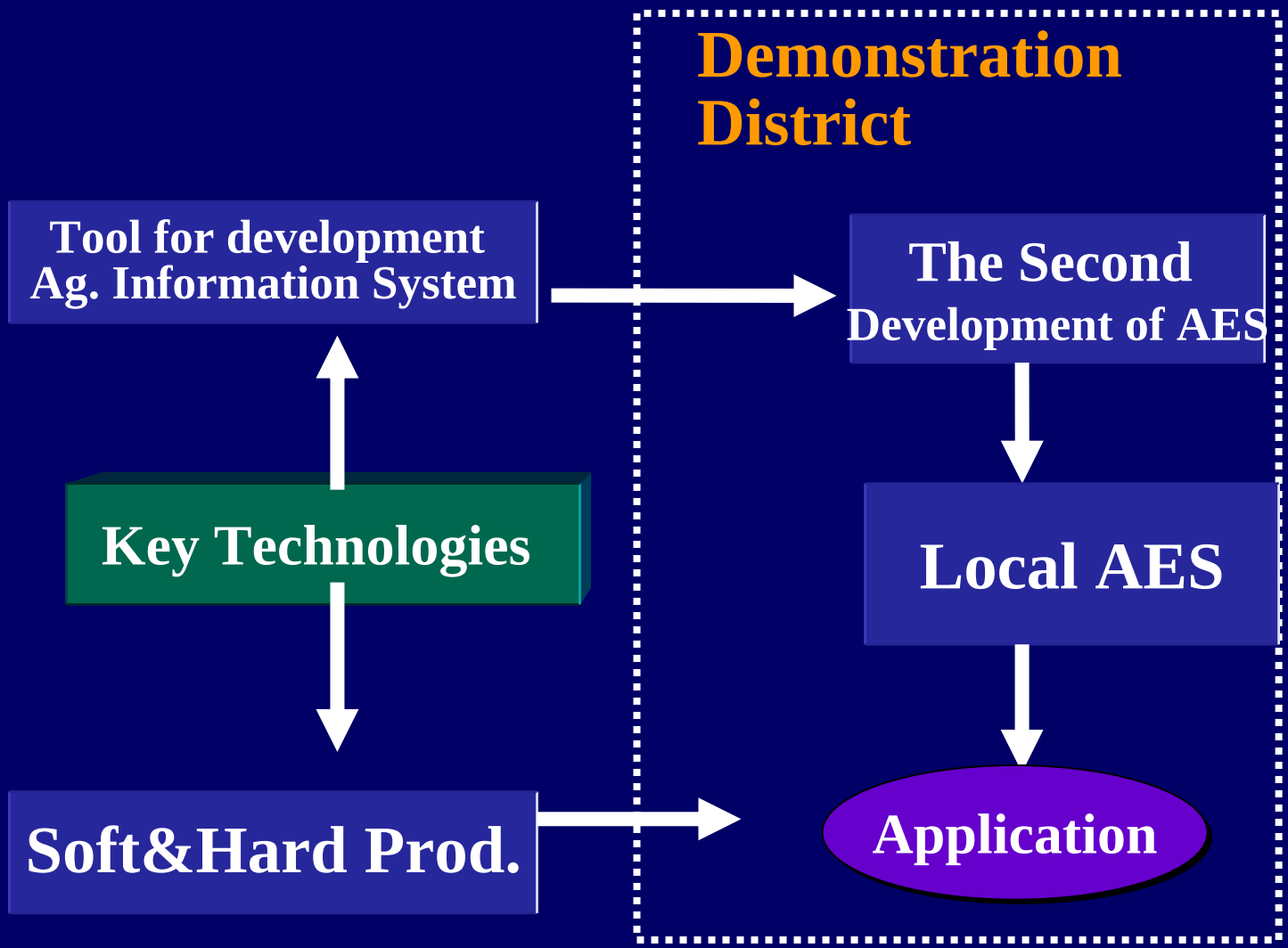
The OBJECTIVE
电脑农业的目标

- **To enhance the level of decision-making for production,increase the yield, decrease the cost and pollution.**
- **To help farmer to adopt the market.**
- **To increase the income of farmers.**
- **To cover the information gap in rural area.**
- **To improve the traditional agriculture by IT.**

The TASK
电脑农业的主要任务

- **To build up the AES platforms to transfer agricultural knowledge, technologies & information for agricultural technicians**
- **To develop the valid Agricultural Expert System for farmers**
- **Demonstration and Application**

The IMPLEMENTATION 项目的实施

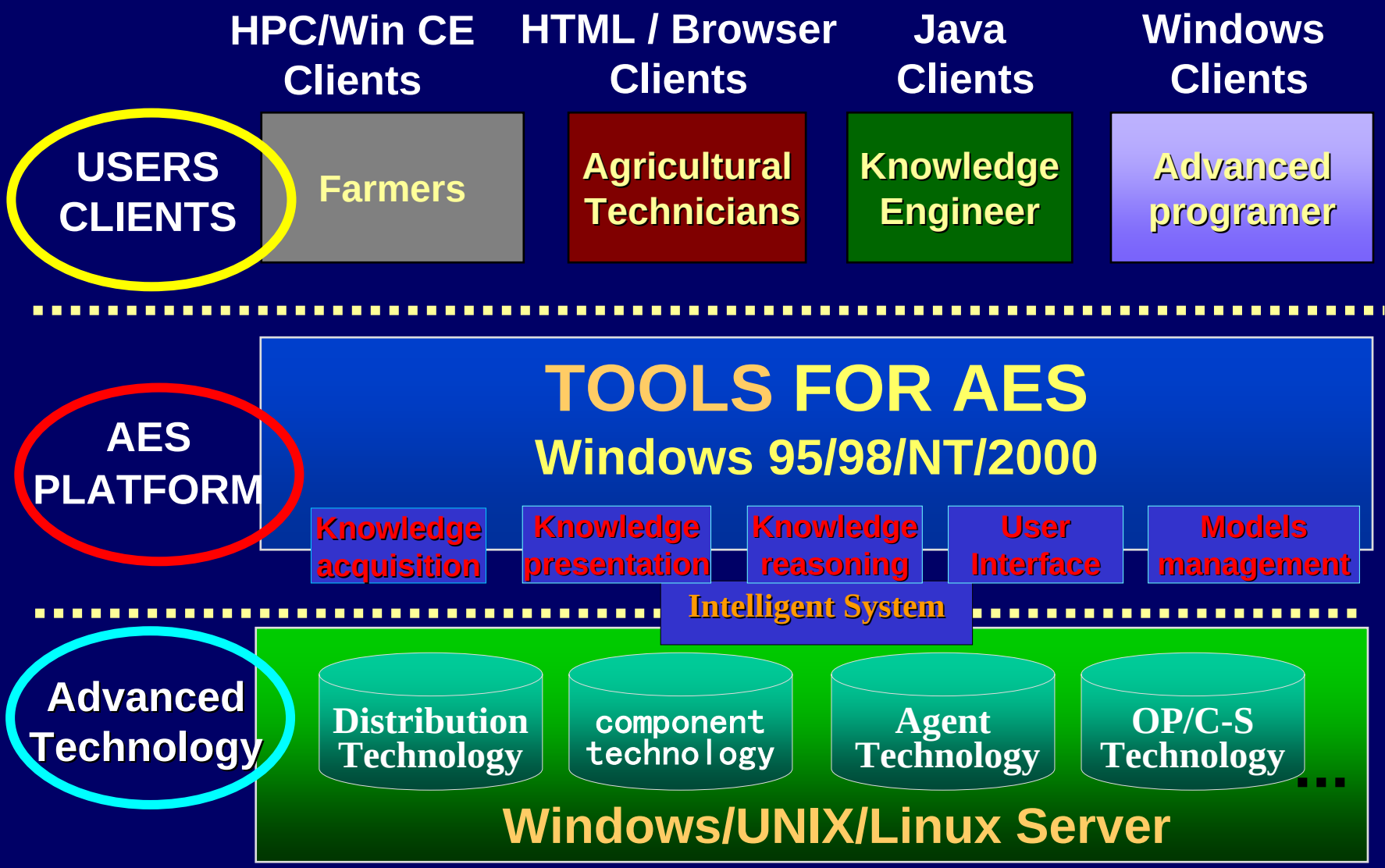


The technical Schedule for AEAES

The IMPLEMENTATION

***To Develop AES platform*开发农业专家系统平台**

- **Five AES platforms are developed for the purpose of secondary development of agricultural expert system with national brand and high quality.**



The structure of AES platform

The IMPLEMENTATION

To develop practical AES开发本地化系统

- **About 200 practical agricultural expert systems which related grain, vegetable, livestock, aquatic production to be developed on AES platform.**

The IMPLEMENTATION

The Function of AES（农业专家系统的功能）

The expert system of *field crop* :

- draw up scientific production goal and design measure scheme in terms of the production
- select variety
- choose rational planting density
- design scientific and rational fertilizer quantity, element proportion and its' spatio-temporal allotted map
- design the technical scheme for water-saving irrigation
- select scientific and rational technique for planting , prevention and cure the diseases and insect pests etc

The IMPLEMENTATION

The Function of AES

The expert system of vegetable (cucumber, tomato etc) :

- planting
- environment controlling
- variety selecting
- Fertilization
- water-saving irrigating
- plant protecting and rotating schedule
- improve the technique level of vegetable farmers.

The IMPLEMENTATION

The Function of AES

The expert systems of fruit tree (apple, pear, peach, grape etc)

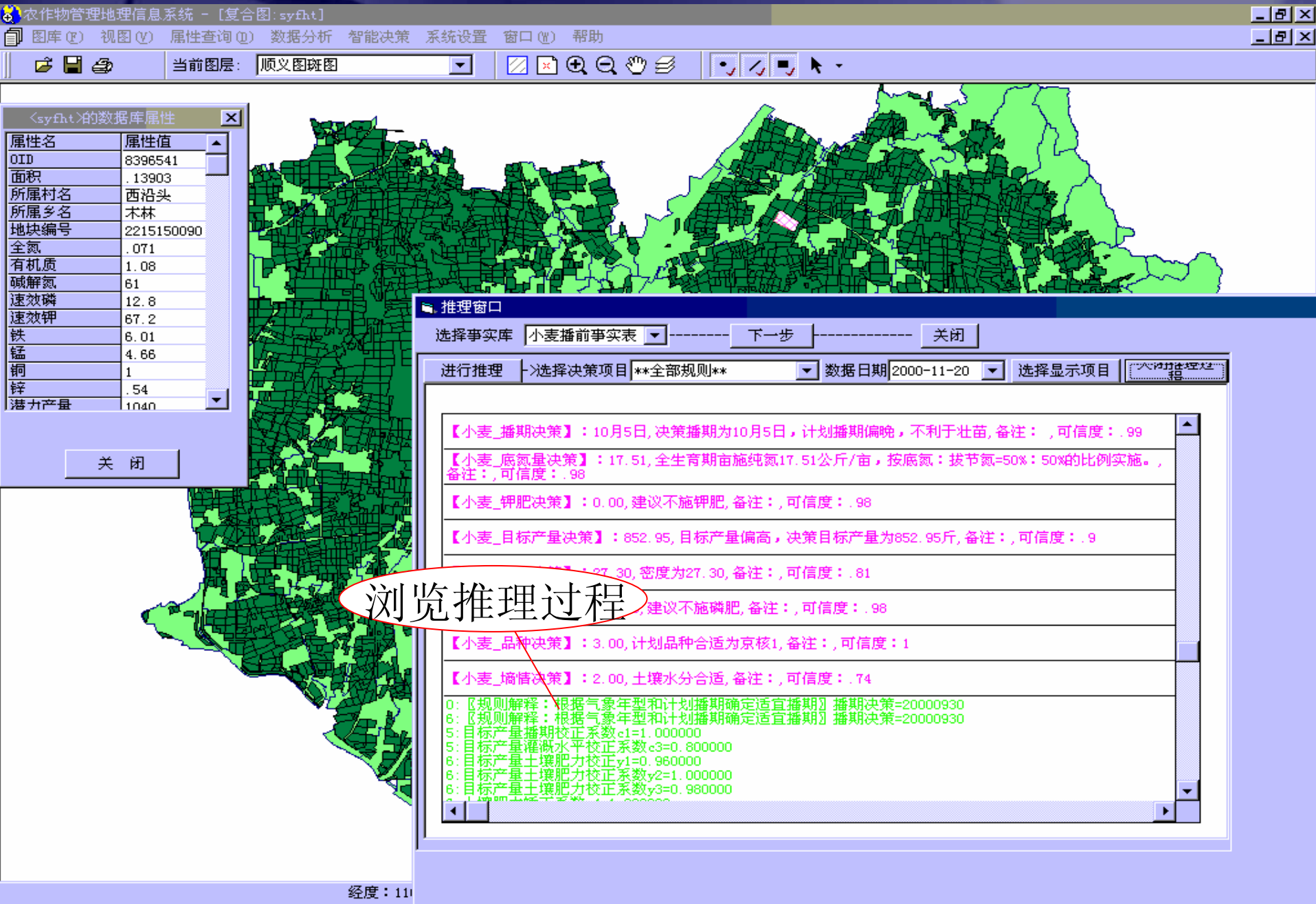
- To diagnose physical disease of the fruit tree according to the symptom that the user describe;
- To confirm prevention and cure measures of the plant diseases and insect pests
- To manage water and fertilizer rationally based on climate, soil and variety
- To decide the chemical controlling time and dosage according to the fruit tree's growth status and physical index.

The IMPLEMENTATION

ES Integrated with other IT（专家系统集成其他信息技术）

- **The transportable agricultural information systems**
- **The greenhouse control systems**
- **ES integrated with GIS**

The Results


农作物管理地理信息系统 - [复合图:syfht]
图库(F) 视图(V) 属性查询(D) 数据分析 智能决策 系统设置 窗口(W) 帮助
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面积 .13903
所属村名 西沿头
所属乡名 木林
地块编号 2215150090
全氮 .071
有机质 1.08
碱解氮 61
速效磷 12.8
速效钾 67.2
铁 6.01
锰 4.66
铜 1
锌 .54
关 闭
推理窗口
选择事实库 小麦播前事实表
下一步
关闭
进行推理
->选择决策项目 **全部规则**
数据日期 2000-11-20
选择显示项目
【小麦_播期决策】：10月5日,决策播期为10月5日，计划播期偏晚，不利于壮苗,备注： ,可信度：.99
【小麦_底氮量决策】：17.51,全生育期亩施纯氮17.51公斤/亩，按底氮：拔节氮=50%：50%的比例实施。,备注：,可信度：.98
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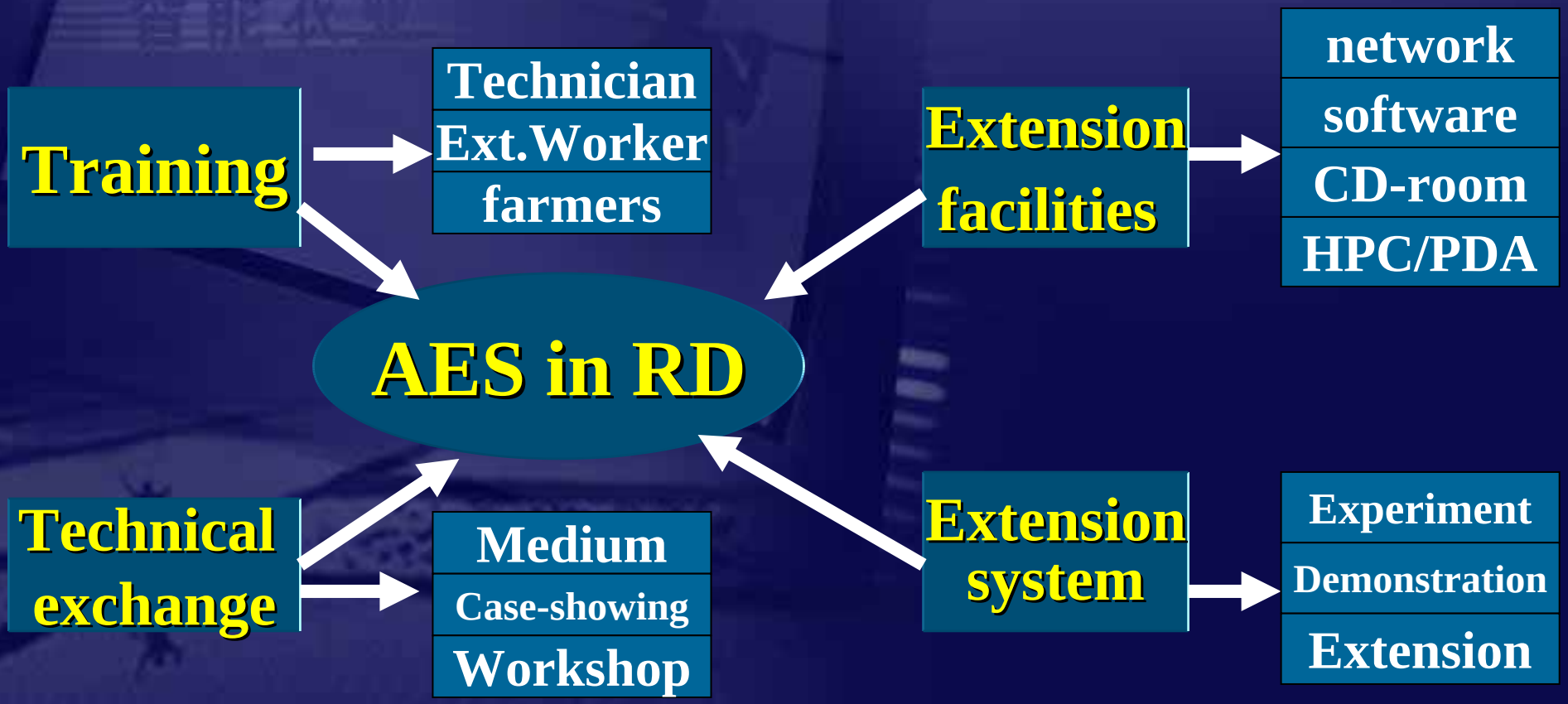
27.30,密度为27.30,备注：,可信度：.81
建议不施磷肥,备注：,可信度：.98
【小麦_品种决策】：3.00,计划品种合适为京核1,备注：,可信度：1
【小麦_墒情决策】：2.00,土壤水分合适,备注：,可信度：.74
0:【规则解释：根据气象年型和计划播期确定适宜播期】播期决策=20000930
6:【规则解释：根据气象年型和计划播期确定适宜播期】播期决策=20000930
5:目标产量播期校正系数c1=1.000000
5:目标产量灌溉水平校正系数c3=0.800000
6:目标产量土壤肥力校正y1=0.960000
6:目标产量土壤肥力校正系数y2=1.000000
6:目标产量土壤肥力校正系数y3=0.980000
浏览推理过程
经度：11

The IMPLEMENTATION(4)

Demonstration & Application示范应用



The schedule of demonstration & application

The IMPLEMENTATION(4)

Demonstration & Application

- **To set up 23 demonstration & application districts of AEAES in 22 provinces on three levels**
  - **experiment plots**
  - **demonstration district**
  - **extension area**

Demonstration & Application System

Experiment plots （试验区）

- To experiment and demonstrate Under the different conditions , set contrast
- To accumulate scientific data
- To confirm and improve AES.
- To get the scientific experience for AES extension and application.

Demonstration district （示范区）

- To demonstrate the application of AES on large scales
- To summarize the experience and the model of IT service agriculture.

Extension area（推广区）

- To apply AES extensively based on the result of experiment plot and demonstration district

The distribution map of AES in order
分六批建立电脑农业示范区23个

1st：Beijing、jilin、Anhui、Yunnan

2nd：Hunan、Hebei, Shandong、Yangli、Gansu

3rd：Shanxi、Tianjin、Sichuan、C ngqing、Xinjiang、Heilongjiang

4th：Henan、Liaoning

5th：Ningxia、Guangxi、Hainan

6th：Neimenggu、Shanxi、Guizhou

The IMPLEMENTATION (4)

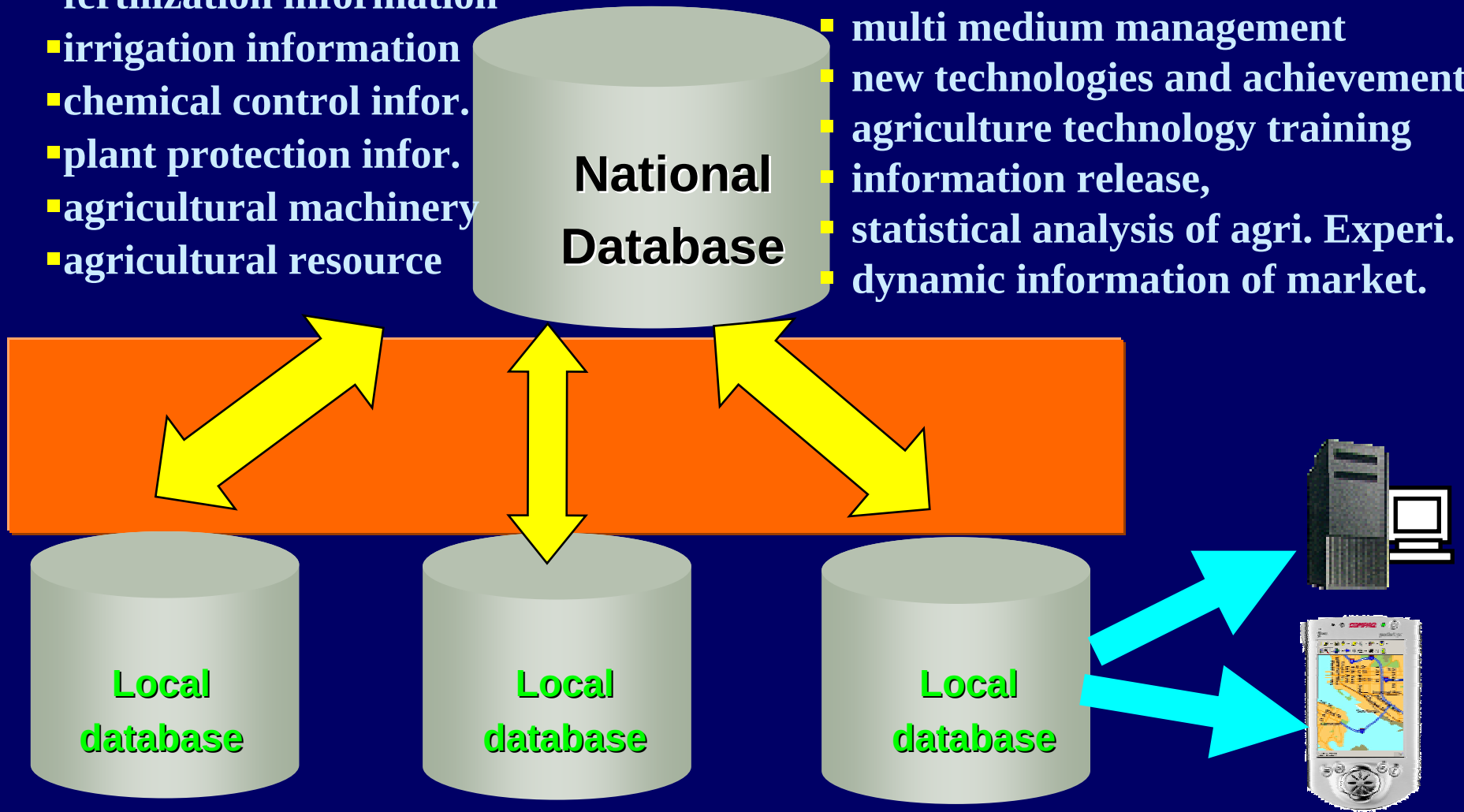
Demonstration & Application

- **To set up the computer network for AES application & extension, the remote users can use AES and get the different information service from database on website.**

The computer network provide farmer information as

- weather information
- soil information
- varieties information
- fertilization information
- irrigation information
- chemical control infor.
- plant protection infor.
- agricultural machinery
- agricultural resource

- agricultural machinery
- agricultural resource
- dynamic infor. of agri. production
- potential production of crops
- multi medium management
- new technologies and achievements
- agriculture technology training
- information release,
- statistical analysis of agri. Experi.
- dynamic information of market.



智能化农业信息网

www.863ait.org.cn

国家八六三计划

智能化农业信息处理系统

首 页 | 网上调查 | 示范区简介 | 会议交流 | 信息反馈 | 广告服务 | 留言板

863 AIT 信息通报

- 实施农业信息化战略，促进农村经济发展 NEW!
- 利用信息技术改造传统农业（.ppt）
- 智能化农业信息技术应用示范工程工作汇报（.ppt）
- 智能化农业信息技术应用示范工程监理评估报告（.ppt）
- 抓好智能化农业信息技术应用示范区建设带动我国农业信息技术的快速发展（.ppt）

863 AIT 示范工程简介

- 立项背景
- 示范工程组成
- 示范工程组织机构

863 AIT 示范工程进展

- 农业专家系统开发平台
- 关键技术攻关进展
- 示范区建设
- 智能农业信息技术研究发展中心

863 AIT 示范工程简报

- 2002年第1期
- 2002年第2期
- 2002年第3期
- 2002年第4期
- 2002年第5期
- 2002年第6期
- 2002年第7期
- 2002年第8期

国家863计划"智能化农业信息处理系统"技术培训班及经验交流会在长春举办

最新通知

关于国家863计划项目“智能化农业信息处理系统”工作进行检查的通知

根据专家组对863计划项目“智能化农业信息处理系统”工作的总体安排，专家组决定组织技术总体组和有关专家，于9月中下旬开始去示范区进行检查和工作调研，请根据各示范区的实际情况做响应安排，提前作好准备。专家去示范区之前将提前一周通知。技术总体组电话：010-

最新动态 News

- 国家863技术总体组专家去黑龙江示范区调研检查工作（2002-10-16） NEW!
- 马颂得副部长考察云南电脑农业专家系统推广应用情况 (2002-10-10) NEW!
- 国家863计划"智能化农业信息处理系统"技术培训班及经验交流会在长春举办 (2002-9-2)
- 安徽示范区近期工作扫描（2002-7-15）
- 中国科学院合肥智能所863计划"智能化农业信息处理系统开发平台"工作进展（2002-7-15）
- 黑龙江示范区2002年春季工作纪实（续2002-7-15）
- 河南省将于7月22日举办智能化农业信息技术培训班（2002-7-1）
- 四川省副生长在科技周展览会上高度评价四川农业信息化工程研究中心的工作（2002-5-29）
- 黑龙江示范区2002年春季工作纪实（2002-5-20）
- 2002年5月河北省在石家庄举办农业信息高技术研修班（2002-5-20）
- 2002年5月李岚清在山东考察时强调：大力推进科技创新加快发展现代农业（2002-5-5）
- 国家科技部刘燕华副部长、鹿大汉秘书长、农社司贾敬敦副司长及商五一处长一行到四川省广安市视察智能化农业信息技术村通工程实施情况 (2002-4-29)
- 国家科技部农社司陈传宏副司长到省农业信息工程技术研究中心检查指导工作 (2002-4-5)
- 智能化农业信息处理系统项目技术总体组在京召开工作会议 (2002-4-23)
- 2002年第一期"全国农业专家系统开发平台"培训班在北京成功举办 (2002-3-24)
- 关于尽快签定农业专家系统开发平台服务协议和建立示范区网站的通知 (2002-3-17)
- 更多信息》》》》》

最新通知

Click Here

The website of AEAES

The IMPLEMENTATION(4)

Training & popularization program培训与推广

- To train the administrator how to manage the project and the organization skills of application & extension of AEAES
- To train agricultural technicians the skills of secondary development of AES
- To train farmers how to use AES software

Popularization activities（推广活动）

- Set up model samples(建立应用示范样板)
- Technical activities (技术指导与检查）
- Showcase & workshop(现场经验交流会)
- To train administrators(培训管理者)
- To train the technicians(培训农业技术人员)
- To train farmers(培训农民)
- To summarize experiences(总结与表彰)

The RESULTS实施效果

Technology Progresses(1996-2003)

- **Developed 5 platform software products with self-ownership copyright**
- **Developed more than 200 practical agricultural expert systems of about 80 crops and husbandry animals**
- **Significant progresses in 10 key technologies for AES**

The RESULTS实施效果

Extension Network (1996-2003)

- **23 demonstration &extension districts were established in 22 provinces**
- **5 levels Extension networks were set up from national, provincial, county, town, to village**

The RESULTS 实施效果

Considerable Economic Outcome(1996-2000)

- **Application area : 3 million hectares**
- **Increased yield : 2. 48 billion Kg**
- **Increased economic output: 280 million $**
- **Decreased product cost: 77.6 million $**
- **Total Economic benefit: 357.8 million $**

The RESULTS 实施效果

Considerable Social Outcome(1996-2003)

- **1,7000 technicians were trained of computer technologies**
- **8 million farmers were trained**
- **Provided 3 million pieces of technical datum for farmers**
- **7 million farmers in 800 counties and farms have benefited from the project**
- **Enhanced the scientific & technical level of farmers, managers, agricultural technicians and extension workers**

The EVALUATION
对中国电脑农业的评价

•The evaluation from farmers
农民对电脑农业的评价

- We can find expert in home
- Computer can tell me what and when to do
- AES can help us for ever

- **The evaluation from national leaders**
- 国家领导对电脑农业的评价

- **The evaluation from administrators**
- 地方行政官员对电脑农业的评价

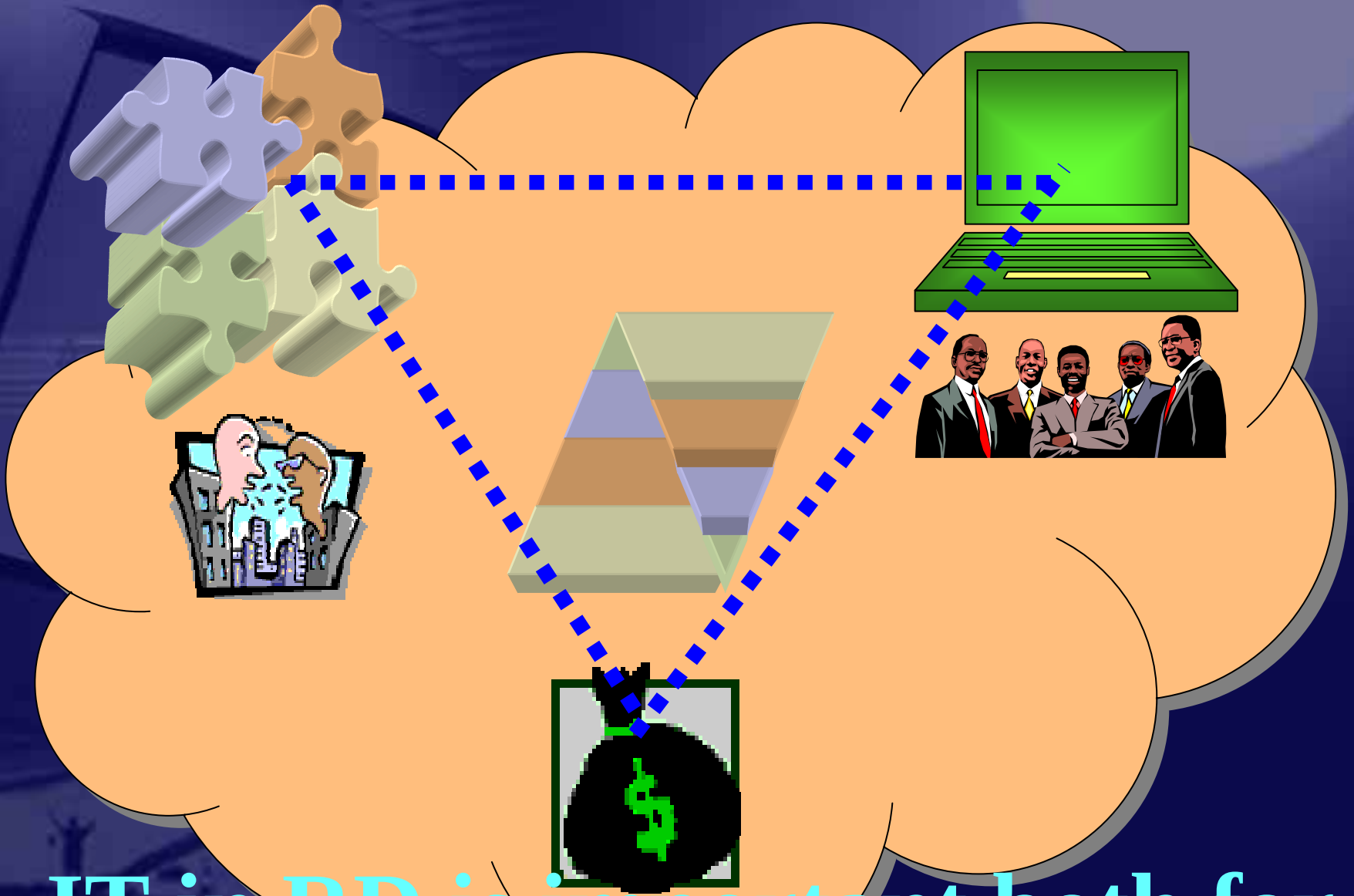
- **The comments of Agricultural Experts**
- 农业专家的评价

The evaluation from International
国际上对中国电脑农业的评价

- **1st International Symposium On Intelligent Information Tenchnology in Agriculture**
- **第一届智能化农业信息技术国际学术会议**
- **2nd International Symposium On Intelligent Information Tenchnology in Agriculture**
- **第二届智能化农业信息技术国际学术会议**
- **Best e-content, WSA,WSISI,UN,2003.12**
- **2003年中国电脑农业获得联合国世界信息峰会最高成就奖**

THE CONCLUSIONS主要结论

- **AES is a powerful tool for farmers**
- 农业专家系统是农民的好帮手
- **AES should combine with local RD**
- 农业专家系统的推广要与当地农村经济发展相结合
- **Local government will take important roles in the application of AES**
- 要充分发挥当地政府的作用
- **To take different extension model & extension method on different conditions**
- 不同地区采用不同的推广模式和手段



IT in RD is important both for farmers and government

- **The farmers both in rich area and in poor area need IT to support their production and market management**
- 中国富裕和贫穷地区的农民需要信息技术服务他的农业生产和市场经营
- **China now has a certain foundation of IT in RD, Both in facilities and in technologies, information resources**
- 中国农村在基础设施、技术和信息资源方面已有一定基础。

BAITRC

- The IT in RD in China is now in the stage of developing, need international cooperation to promote

农村信息技术的发展需要国际合作