Know-how for Horticulture™

China study tour & attendance at the World Potato Congress, Kunming, March 2004

John Rich
Tasmanian Farmers and Graziers Association

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Know-how for Horticulture™

FINAL REPORT ON THE WORLD POTATO CONGRESS AND STUDY TOUR – CHINA

(PTO3067)

24th – MARCH- 8th APRIL 2004

John Rich – June 2004

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INTRODUCTION

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Purpose of the report:

Project PTO3067 supports the attendance of 8 potato industry representatives at the March 2004 World Potato Congress and China Study Tour. The Congress delegates were addressed on a wide range of topics and visited farms, factories, markets, research establishments and met with Government officials.

The topics included in this report are, achieving sustainability in potato production, breeding for low input potato varieties, erosion control – successful experiences on Prince Edward Island, environmentally friendly crop protectants – listen to the kookaburras, successful experiences in seed promotion, impact of consumer trends on potato consumption, processed potato product promotions, successful experiences in table potato promotion, information and competitiveness, the present and prospect of potato industrial development in China, development of potato industry and prospects, biotechnology in potato breeding of China, developing potato industry in Inner Mongolia, overview of transgenic potatoes and their biosafety in China, current status of potato processing sector in China and the way out for future development, agricultural tour, visit to the Heilongjiang Department of Agriculture, organic China, Harbin Economic Development Zone, visit to Technico, Kunming, meeting with Chinese Academy of Agricultural Sciences, visit to Chinese Academy of Agricultural Sciences (CAAS) Institute of Vegetables and Flowers, effects of climatic changes on the weather and implications for global production, world water supplies, are the adequate global initiatives in late blight, regional reports, British Potato Council – past and present, changing to meet current needs, global trends in demand, production and research, biotechnology, its role in future global potato production, environmental and food safety issues of GM potatoes.

Acknowledgement:

The Congress and Study Tour participants acknowledge with thanks, the financial support from Horticulture Australia Limited and the travel arrangements made by AgTour Australia.

SUMMARY

The 5th World Potato Congress was held in March 2004 in Kunming, in the Yunnan Province in the South West of China. Kunming is known as the Eternal Spring City.

The Yunnan Province has a population of around 43 million people. The city of Kunming has a population of around 5 million. The population of China is around 1.2 billion.

The Congress is held every three years. This one was delayed by one year because of the SARS scare during 2003. Previous Congresses have been held in Canada, England, South Africa and Holland.

The World Potato Congress brought together over 1100 people from 43 countries. Those in attendance covered all aspects of the potato industry. The attendees included growers, marketers, researchers, processors, government officials and suppliers of goods and services to the industry. The Australian delegates amounted to around 30 people.

A trade exhibit area attracted about 250 exhibitors. The Australian minituber company, Technico, had a large display area. Technico have a minituber seed production facility in Kunming.

A question on the lips of many people is, why hold a potato congress in China? The answer is most interesting. China produces around 65 million tonnes of potatoes, which happens to be about 21% of the 309 million tonnes currently being produced in the World.

It is necessary for visitors to China to have regard for numbers and scale of operation when in China. The comparison we could make about tonnage is that the total Australian production is about 1.5 million tonnes, which is only 2.3% of what is produced in China.

Potatoes have been grown in China for over 400 years. During the last ten years it would seem that the importance of potatoes has increased fairly dramatically. Chinese officials see potato production as one of the strategies which will add value to the position of agriculture and to be a means of increasing farmer's incomes.

A senior Chinese official commented that 90 million farmers in China grow potatoes. It was stated there is a need to improve incomes because there is not enough money for farmers now. A visit made to an outlying rural area, certainly supported the comments made about low incomes. The entire area looked to be severely depressed. Advice was given that the area had been constantly farmed for over 2,000 years.

The local farmer's association President said that his organisation had 1.3 million members. It was understood that the farmers leased the land from the Government and each farmer (in that location) had only a relatively small area, perhaps about half a hectare. There appeared to be very little mechanical equipment being used.

The land area of China is about the same as that of Australia. China has about 130 million hectares of arable land, that's about 325 million acres.

The area used for potatoes grown in China to produce the 65 million tonnes is around 4,719 million hectares. The average yield is only around 13.7 tonnes per hectare.

Potato production is now the fifth most important crop after rice, corn, wheat and sweet potatoes.

The spirit of the World Potato Congress is to encourage dialogue between potato industry representatives from the various countries. It wishes to assist in developing friendships between International participants. It aims to have researchers and the scientific community sharing ideas and outcomes. There is always the opportunity to encourage trade.

The Chinese Government and all sectors of the Chinese Potato Industry fully embraced this concept. Chinese speakers and Officials gave much emphasis to the work being done to explore and adopt new potato technology. There is a desire to promote more International co-operation, aiming to strengthen research and improve growing, processing and marketing.

There is little doubt that the Chinese have many major challenges ahead. The top ten potato production regions, by planted area, have yields ranging from 6.2 tonnes per hectare to 16.3 tonnes per hectare. The average yield for the top ten areas is 12.5 tonnes per hectare. It is difficult to see how the yields can be improved without massive injections of finance. There is very little evidence of modern irrigation methods being used. Mechanical implements were a scarcity in the areas visited. Harvesting and transport systems were reported to be very basic. Disease control is a major issue for the growers.

The average age of Chinese farmers is increasing and this was stated to be because the young people do not see the financial returns from farming and the way of life, to be attractive. They are moving to the cities for what they believe to be a better quality of life.

Western influences are emerging in China. The fast food industry is now expanding at a rapid rate. KFC which commenced in China in 1987, currently has 900 restaurants and they plan to open one new restaurant every second day in the year ahead. McDonalds have 560 restaurants and they plan to open 100 new outlets during 2004. The estimate is made that currently in China, over 3 million people are being served fast foods every day.

The Government appears to have committed resources to research and development for potatoes and all other sectors of agriculture. The Chinese Academy of Agricultural Sciences reports that they currently have around 16,000 scientists operating from 41 Institutes. The value of the Agriculture as a percentage of the GDP is increasing and the aim is to continue this trend.

Chinese officials make it clear they want to have international collaboration and partnerships. The Academy of Agricultural Sciences reported that it has collaboration arrangements for potatoes with the USA, Canada, Holland, France, Italy, Belgium and the United Kingdom. This co-operation covers technical, machinery, processing, irrigation and harvesting.

Potato usage in China is as follows,

Food – fresh market	30%
Animal Feed	30%
Seed	8%
Process (mainly coarse starch)	22%
Other	10%

Only a very small percentage of current production is used for french fry processing. A small percentage is also used for crisping. An assumption can easily be made that the quantity of potatoes used for french fries and for crisping will surely increase.

Chinese officials identified the challenges facing Chinese agriculture as, quality, quantity, diversity, safety and security, competitiveness, environment and sustainability. There is much work to be done in each of these areas by the Chinese.

This summary has been prepared from notes and observations presented to the Project Leader, John Rich, by the HAL funded Congress and Study Tour participants.

The Australian attendees at the World Potato Congress who received funding assistance from Horticulture Australia Limited (HAL), acknowledge and thank HAL for the financial support.

TOUR PARTICIPANTS

HAL Funded Participants

Mr Phillip Beswick	Sisters Creek – Tasmania
Mr Geoff Crick	Ballarat – Victoria
Mrs Claudette Crick	Ballarat – Victoria
Mr Iain Kirkwood	Devonport – Tasmania
Mr John Oakeshott	Sydney - New South Wales
Mr Ralph Papalia	Busselton, - Western Australia
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Additional Contributors to the Report:

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ACHIEVING SUSTAINABILITY IN POTATO PRODUCTION

Presented by: Dr. Anton Haverkort, Research Manager, Wagenin University, The Netherlands

Abstract

Potato production is sustainable if the three 'P' requirements are met,

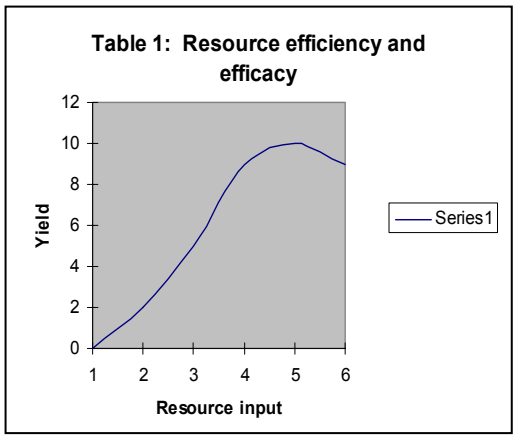
1. People: To benefit from healthy nutritious food that is produced in a socially acceptable way.
2. Profit: For all links in the chain.
3. Plant: Optimise use of resources and the plant should not suffer.

This presentation dealt with the third P – Plant.

Key Facts

The efficiency and efficacy of resources follows a diminishing return against yield (table 1). The resources are;

- Land
- Water
- Nutrients
- Energy
- Pesticide



Degrees of sustainability can be divided into three areas which are;

- Current cropping systems
- Integrated cropping systems
- Organic cropping systems

Current sustainability programs can be divided into three areas;

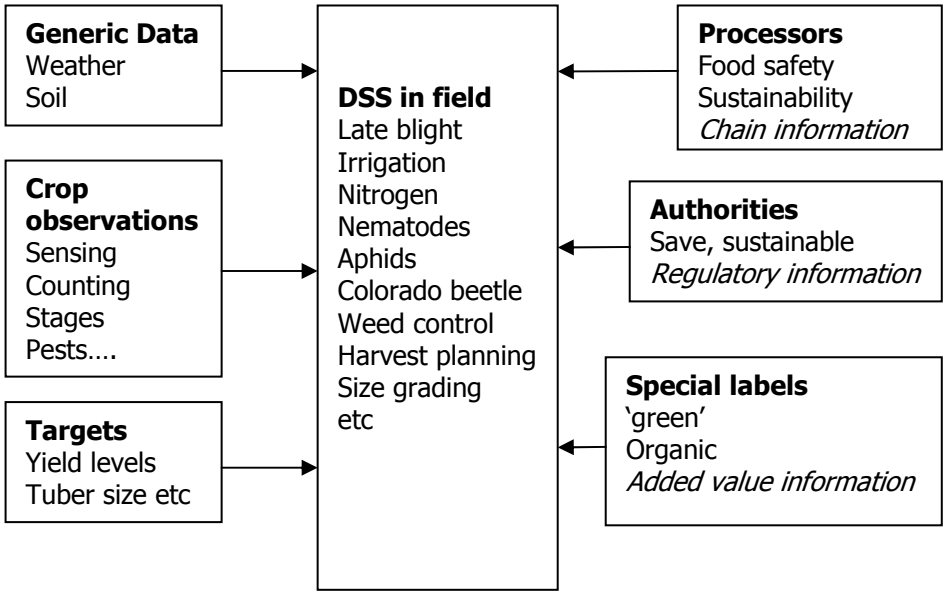
1. **Integrated Pest Management (IPM):** Late Blight planner, nematode detection, weed control, aphid counts, pheromones, Colorado beetle control.
2. **Integrated Crop Management (ICM):** Irrigation planner, pre-plant mineral sampling, supplemental N dressing, models and DSS.
3. **Integrated Farm Management (IFM):** Crop rotations (health & fertility of soil), organic matter amendments, erosion control, catch crops to utilise unused nutrients, transport and storage.

SWOT analysis of potato sustainability production

Strengths: More efficient user of resources than other crops (esp. cereals)
Weaknesses: High transportation of water (in produce), perishable fresh produce.
Opportunities: breeding of GMO's, IPM, DSS etc.
Threats: Susceptible to diseases.

Achieving sustainability in potato production:

A field decision support system requires inputs from the following;



Standardisation and certification (a mix of food safety and sustainability issues).

- Local for local
- Company policies (competitive, 'green labels')
- National regulations (eg BRP and Minas) and labels
- Voluntary schemes (eg Assured produce)
- National consortia (Duurteel NL)
- Regional consortia of food chains (EuropGAP using HACCP)
- International organisations: CIES with GFSL, CIAA, GEMI, SAL…
- Increasing role of DSS solutions within chains, withdrawing governments.

An example of good agricultural practices established by Unilever include the following;

- Soil health
- Soil loss
- Nutrients
- Pest management biodiversity
- Product value
- Energy
- Water
- Social and human capital
- Local economy

Major strides are needed in the following areas;

- Combating Late Blight (genetic, hygienic, GILB)
- Reducing variability (size, quality) to increase recovery
- Reinforce IPM, ICM and IFM programmes (GFSL, CIAA)
- Development of Decision Support Systems (DSS) (mandatory?)
- Pre-competitive standards and certificates (eg. SAI following the Unilever example)

BREEDING FOR LOW INPUT POTATO VARIETIES

Presented by: Dr Ewa Zimnoch-Guzowska, Mlochow Research Center, Poland

World potato production is a little over 300 million ha with an average yield of about 15t/ha.
Europe and Asia have the highest areas of production (120 million ha each), however, the North America (about 20 million ha) and Oceania have average yields of close to 35t/ha.

The world used 136 million tonnes of fertiliser in 2000, with Asia using the most at 76 million tonnes. North America and Europe consumed about 23 million tonnes each. Africa was the lowest with only 3 million tonnes applied.

The number of sprays used in 2002 for Late Blight (Hijmans, 2002), were 4 for undeveloped countries and 7 in developed countries on average. It is predicted (Simcast) that this will increase to 12 in developed countries and 7 in the underdeveloped (average).

Currently the recipients of low input potato varieties fall into three categories;

- Low input farming
- Organic farming
- Farming in low income countries

There is a increasing trend towards organic farming in the 15 European Nations. (This is certified and policy supported organic and in-conversion land area in the EU). In 1985 there was around 100,000 ha. This has grown steadily to 4.5 million hectares in 2001.

The characteristics that are being requested for low input varieties are in two areas;

1. Breeding resistance to Late Blight, viruses, Colorado Potato Beetle, nematodes, bacteria and other pathogens.
2. General adaptability, tolerance to drought, storage ability and tolerance to stresses.

A basic survey of world wide breeding programs showed that the priority was overwhelmingly towards the breeding of resistance to Late Blight. Of the 40 potato varieties that have been listed as showing resistance to Late Blight the most commonly used in breeding programs are;

- Stirling (5)
- Jacqueline Lee (3)
- Kuras (3)
- Lugovska (3)
- Zarevo (3)
- Bionta (2)
- Innovator (2)
- Toredon (2)
- Cara (2)

In breeding the most frequently used wild species out of a list of 27 are the following;

- S. demissum (16)
- S. bulbocastanum (13)
- S. microdontum (9)
- S. stoloniferum (8)
- S. andigena (6)
- S. berthalti (6)
- S. haugasii (6)
- S. phurega (6)
- S. verracosum (6)

In a database containing all potato varieties (www.europotato.org) there are close to 1000 varieties with partial resistance to *P. infestans*. Very few show strong resistance. The most important factors in breeding for Late Blight are that there is not sufficient agronomic benefit from those varieties showing resistance, there is a negative correlation between earliness and resistance, and there are problems with selection methods and pathogen diversity.

Assumptions on breeding

- There is a high input of basic and breeding research globally focussed on progress in Late Blight resistance in large national and international programs ie. GILB, CIP, CEEM, EUCABIGHT etc.
- 25% of global breeding programs were surveyed that showed 450,000 crosses were being tested for Late Blight resistance.
- One cultivar was selected out of 100,000 seedlings.
- Globally, about 16 new Late Blight resistant cvs are realized yearly.

Viruses are a major source of crop losses.

Losses in potato yield due to viral infections (Noordam, 1989)

Virus	**Yield decrease up to %**
PLRV	92
PVY	85
PVM	25
PVX	36

Low income farmers use carryover seed for ware crops leading to reduced yields and increases in viruses. Potatoes infected with PVY (NTN) when the tubers are exposed to high temperatures show symptoms of Potato Necrotic Tuber Virus.

Solanum species utilised in breeding for resistance to viruses.

Virus	**Solanum species**
PVY	adg, chc, sto
PVX	adg, chc, aci
PLRV	adg, chc, aci, dms
PVS	adg
PVA	chc, sto
PVM	grl, meg

Over 2000 varieties are recognised as showing some resistance to each of PLRV and PVY. Just under 1000 varieties show a degree of resistance to PVM.

The problems facing the further development of low input varieties are;

1. Limited number of sources of good adaptability for high resistant varieties to diseases.
2. Selection methods applied – limited use of MAS
3. Limited exchange of information – public and private breeding programs, internationally.
4. Acceptance of transgenics
5. Developed pre-breeding programs

EROSION CONTROL – SUCCESSFUL EXPERIENCES ON PRINCE EDWARD ISLAND

Presented by: Mr Ron DeHaan, Soil and Water Engineer, Prince Edward Island, Canada

Prince Edward Island (PEI) has an annual rainfall of 1100 mm/yr, soils are a fine sandy loam with low organic matter (OM) and long steep slopes. Two major soil erosion events occur per year – winter thaw and summer thunderstorms. Both events lead to watercourse siltation, nutrient enrichment in waterways (particularly high P soil leaching leading to algal blooms) and pesticide contamination with recorded fish kills.

A voluntary farm plan was completed by most PEI potato growers. The plan involved doing a complete environmental audit of their whole farm operation. As part of the audit, the erosion potential of each field is evaluated along with its possible impact on watercourses and wetlands. Average OM levels are 2.5% and the new legislation is targeting to increase this to 3% average.

PEI grows 45,000 ha of potatoes on 110,000 ha of land that is in a potato crop rotation. 60% of the production is on a potato/grain/forage 3 year rotation. 38% is on a potato/grain or potato/ryegrass 2 year rotation. *Crop Rotation Legislation* was introduced in 2002 that requires producers to have a management plan if rotations are shorter than 1 row crop every three years or if slopes are being row cropped with slopes greater than 9 degrees.

Trials of residue management vs conventional tillage have shown;

- Average $100/ha saving in tillage costs
- Average 2.4 t/ha yield increases
- Average of 9 times less erosion before hilling
- No significant increases in Rhizoctonia, Common Scab, Fusarium Dry Rot, Silver Scurf, Phoma Rot, and Stem End Discoloration
- Cooler soil temperatures and higher soil moisture levels in early spring

Traditional tillage program is - fall plow, spring disc, then harrow. (trial site 3% OM)
New residue management program is:- 1 chemical burn-off, then two conventional tillage passes. (trial site 5% OM)

To reduce the winter thaw run-off, just prior to potato harvest the recommendation is to broadcast a winter wheat or if the harvest is too late to apply a dry mulch after harvest @ 3.5t/ha. Both methods will give a 9% less run-off advantage. Current erosion methods being encouraged include grassed headlands, 10m buffer zones to waterways, and farmable berms (intercept row drainage that conveys to suitable outlets). Current research is examining single pass hill formers with teeth (damer dykers) that create small holes @ 40cm centres. This helps reduce in furrow water erosion. (Note: This has been trialled in Tasmania with little success on Kraznozem soils).

ENVIRONMENTALLY FRIENDLY CROP PROTECTANTS – LISTEN TO THE KOOKABURRAS

Presented by: Dr Rachel Walker, Serve Ag Research, Tasmania, Australia

Current trials on alternative crop protectants include;

1. Plant defence boosters – acibenzolar S methyl, phosphoric acid, chitosan.
2. Biofungicides – Trichoderma strains, Bacillus subtillus strains, Conjothyrium minitans strains
3. Potato seed treatments – Douglas fir bark
4. Organic inputs – compost teas, worm castings, organic herbicides

Public awareness will ensure best practice chemical use and increase attention to IPM. Australia is well aware of environmentally friendly crop protectants – many world producers are not. With the expected stricter monitoring for residues on food (particularly imported), finding alternative pesticide and herbicide treatments and enhancing IPM will require further R&D funding.

SUCCESSFUL EXPERIENCES IN SEED PROMOTION

Presented by: Jos Lazarows - The Netherlands

Netherlands Potato Consultative Foundation believes the cornerstone for development of their potato export seed industry are research, training, extension and marketing. The major priority of the seed inspection and certification scheme is development of disease resistance and the use of less pesticides.

The basic rules are;

1. Initial: Identify markets, field extension, verify testing, training, technical brochures, public relations.
2. Present: public relations, technology transfer, trade related mediator, 'phytosanitary' EU accreditation, variety protection.

Recommendation

Sustainable seed industry in Australia should identify buyers that are successful and promote technology and benefits related to their seed. Consequences for WA seed exports is that it is essential to communicate all the benefits and that research, training and extension stay the cornerstone to identify different needs and deliver to the clients needs. The Netherlands has a strong potato seed cooperation established with China since 1998.

Apathy or inaction could result in a declining potato market in Australia – only through targeted promotion will the industry sustain or increase its market share.

IMPACT OF CONSUMER TRENDS ON POTATO CONSUMPTION

Presented by: Mr Tim O'Connor, US Potato Board, Colorado, USA

World population demographics are changing and with this comes changes in consumer eating habits. For potatoes to hold or increase their consumption appeal to the general populace trends must be successfully analysed and response strategies developed. Fresh potato consumption is going to decrease while processed potato consumption will increase.

The challenge for potatoes is to hold or increase consumption requiring analysis of trends and development of response strategies. All developed countries are facing a decline in the consumption of fresh potatoes and an increase in processed. The speaker commented on the world changes in demographics without providing any insight into how the US Potato Board would be addressing these issues.

Should any Australian promotion focus on the 40 plus age group and the health benefits of potatoes?

Focus needs to be on meals that require little preparation time and involve households with only one or two people (indications that this is an increasing group). Dietary changes (ie Atkins diet) could have major implications for the potato industry.

Lifestyle changes

- Smaller households
- More eating out
- More leisure eating
- Less time for meal preparation
- More disposable income

Successful potato marketers will analyse the trends and shifts in the market place and will develop marketing and production strategies which will respond to the needs of the consumer.

Understanding consumer requirements will be essential for the potato industry to survive in what is now a highly competitive market place.

The US Potato Board has a strategy aimed to increase frozen french fry exports.

PROCESSED POTATO PRODUCT PROMOTIONS

Presented by: Mr J Taospern, US Potato Board, Colorado, USA

Reinvent potatoes by promotion at all sectors of the food chain so that consumers can relate to product modifications which will increase consumption of this staple food. An example of this is the way the US Potato Board marketed shoestring potato fries into Japan.

Key areas were;

- Purpose: Increase sales, identify constraints, impacts.
- Potential: Identify potential market size, market share, penetration, product availability.
- People: target audience (or secondary)
- Purchases: support activities to reach targets

Case study of shoestring frozen fries to Japan. Eaten by children; Japan has an aging population, health conscious adolescents. Strategy was to promote through recipe and ideas book and target pubs, retailers, food manufacturers etc.

Recommendation

Are shoestrings a good product for Australian processors to export to Asia following a similar strategy as the US Potato Board?

SUCCESSFUL EXPERIENCES IN TABLE POTATO PROMOTION

Presented by: Dr M Storey, British Poaato Council, U.K.

Educating the consumers about the benefits of eating potatoes through newspapers, magazines, TV and radio. Provide consumers with a wide variety of choice especially in pre-packaged potato meals that require very little preparation time (pre mash, bake etc).

Potato consumption in Britain is over 100kg/head/annum. There have always been health campaigns in Britain - back in 1939 there was an article printed that potatoes were too fattening to appeal to women, which was the start of the first health campaign.

The issues that BPC are dealing with include the increasing market share of the supermarket chains – (82% market share for spuds); offering consumers variety of products – pre-prepared and packaged – with also a number of options such as pre-mashed, pre roast etc.

By 2021 the traditional household that we know today will only be 10% of the consumer groupings and by 2020 half the population will be greater than 50 years old. Consumers will be more ethnically diverse, more working women, more processed product consumed at the expense of the fresh product. Growing competition from pasta and rice.

'Western Potatoes' closely parallel the strategies of the British Potato Council. BPC has developed a working partnership with supermarkets through a TV campaign and a website that targets youngsters. Marketing based around health and convenience and the knowledge that 2/3rds of purchasing decisions are made in-store.

The BPC is a levy funded organisation.

Three big programs during the year – National chip week in Feb., Health campaign in spring/summer, and a convenience campaign in autumn/winter.

Recommendation

Table potato promotions must move and adjust to the market - changes in the population demographic requires different marketing strategies. Regular surveys are required in order to target marketing campaigns.

INFORMATION AND COMPETITIVENESS

Presented by: Dr Zhilin Gan, Syngenta Asia Pacific, Hong Kong

Consumers are increasing aware and demanding timely and accurate information on the food they consume. All stakeholders in the food chain are now also demanding this information.

Food quality and safety are controlled by the dual forces of consumer/commercial force and government regulatory force.

Traceability systems have been developed and managed through the entire food chain, now using sophisticated electronic tools.

Internet access to information is continuing to gain momentum and acceptance in all sectors of industry

Information systems – eg. QA, EMS, Farm management systems etc will start to have a major impact on the export trade, especially market access. The EU demands that all food be traceable by 2005 will place pressure on all nations to comply.

The future of food production will be similar to manufacturing industry, with an information system, monitoring and recording each step in the process.

Recommendation

Continue to encourage the development and adoption of electronic information transfer systems in the potato industry.

THE PRESENT AND PROSPECT OF POTATO INDUSTRIAL DEVELOPMENT IN CHINA

Presented by: Chen Mengshan, Ministry of Agriculture, China

Yield and planting area of potatoes compared to grains in 2002;

	Area planted (1000 ha)	**Yield (t/ha)**
Grains	103891	4399
Potatoes	4719	13.7[1]

[1]Chinese Academy of Agricultural Science estimates average yield at 13.7t/ha

Potato planting area, production and yield in 2001;

Province (Top five production areas)	**Area planted (1000 ha)**	**Production (10,000t)**	**Yield (t/ha)**
Total	4719	6456	13.7
Inner Mongolia	562	535	9.5
Guizhou	495	641	12.9
Gansu	483	733	15.2
Heilongjiang	421	617	14.7
Yunnan	379	593	15.7

The three current major processors are;

1. Hua'au in Inner Mongolia
2. Runkai in Yunnan
3. Beifang in Ningxia

(Also McCains, Simplot, Carribee and others are testing the market)

The consumer market in China is expanding with more than 1000 western style fast food outlets already established (McDonalds, KFC et al). Estimated that the annual production of potato powder will grow to 30,000 tonnes and pure potato starch will grow to 800,000 tonnes. The total planted area of potatoes will increase to 6 million ha as China adjust the structure and culture and creates winter production of potatoes as an important crop in southern China.

It is estimated that by 2010, 10% of the population will be leading a western life-style including a high consumption of fast food (French Fries). Estimated that feed potatoes will decrease (currently about 30%), processed potatoes for chips, French fries, and fast frozen food will increase to 20% (currently estimated at 5%), starch and its products up to 40% (currently 27% est.), seed up to 10% (current 8% est.), fresh will decrease to 20% (current 30%).

The Chinese Government has taken into 'The 10th Five Year Plan" the breeding of special use and disease resistant potatoes. The desire is to establish a quick, industrial style virus free propagation centres. Seeking cooperation and support (investment) to meet the goals.

Recommendation

Look for areas of production strengths and weaknesses and cooperate with Chinese producers and processors, ie. difference in hemisphere cropping seasons etc. Cooperating with other countries, suggest that Australia strengthens its position with student exchanges and potato experts etc.

DEVELOPMENT OF POTATO INDUSTRY AND PROSPECTS

Presented by: Qu Dongyu, Chinese Academy of Agricultural Sciences.

There are four recognised potato cropping regions in China;

1. Single cropping region in north China
2. Double cropping region in central China
3. Winter cropping region in southern China
4. Mixed cropping region in south-west China

The breeding objectives based on the regions are:

1. Northern cropping region
   - Medium to late varieties
   - Resistance to Late Blight, Common scab, ringrot and virus diseases of the Northeast
   - Tolerance to drought

2. Southern cropping region
   - Early varieties with short dormancy and not sensitive to daylight length.
   - Resistance to virus diseases, common scab and bacterial wilt

Breeding objectives based on utilization;

1. Table
   - Good tuber shape, superficial eyes, and large tubers
   - Medium dry matter content with high vitamin C content (>25mg/100g fresh weight), coarse protein >2%
   - Good flavour and taste after stir-fried or boiled
   - Suitable for storage and transportation and meet export standards

2. Chipping potatoes
   - Lower reducing sugar (<0.25%)
   - Suitable for storage in low temperatures
   - Specific gravity from 1.085 – 1.1
   - Superficial eyes and round tubers

3. French Fry potatoes
   - Reducing sugar lower than 0.25%
   - Suitable for storage in low temperatures
   - Specific gravity from 1.085 – 1.1
   - Superficial eyes with long elliptical or oblong tubers

4. Mashed dehydrated potatoes
   - Reducing sugar lower than 0.25%
   - Suitable for storage in low temperatures
   - High dry matter content
   - Superficial eyes and round tubers

5. Potatoes for starch processing
    - Starch content over 18%
    - White flesh
    - Suitable for long term storage

6. Varieties suitable for special uses
    - Small tubers (5 – 30 grams)
    - Special shape and flesh
    - Medicinal
    - Others

Breeding technologies that China requires;

1. Hybrid breeding technologies
    - Crossing between species
    - Crossing between cultivars
    - Selection of parents and progenies

2. Technologies using 2n gametes
    - 2n gamete frequency over 20%
    - Good agronomic traits

3. Somatic hybrid technologies
    - Failure of sexual crossing
    - Selection of hybrid

4. Molecular marker assisted breeding technologies
    - Disease resistance breeding
    - Improvement of quality
    - Combined with conventional breeding

Seed potato production in China

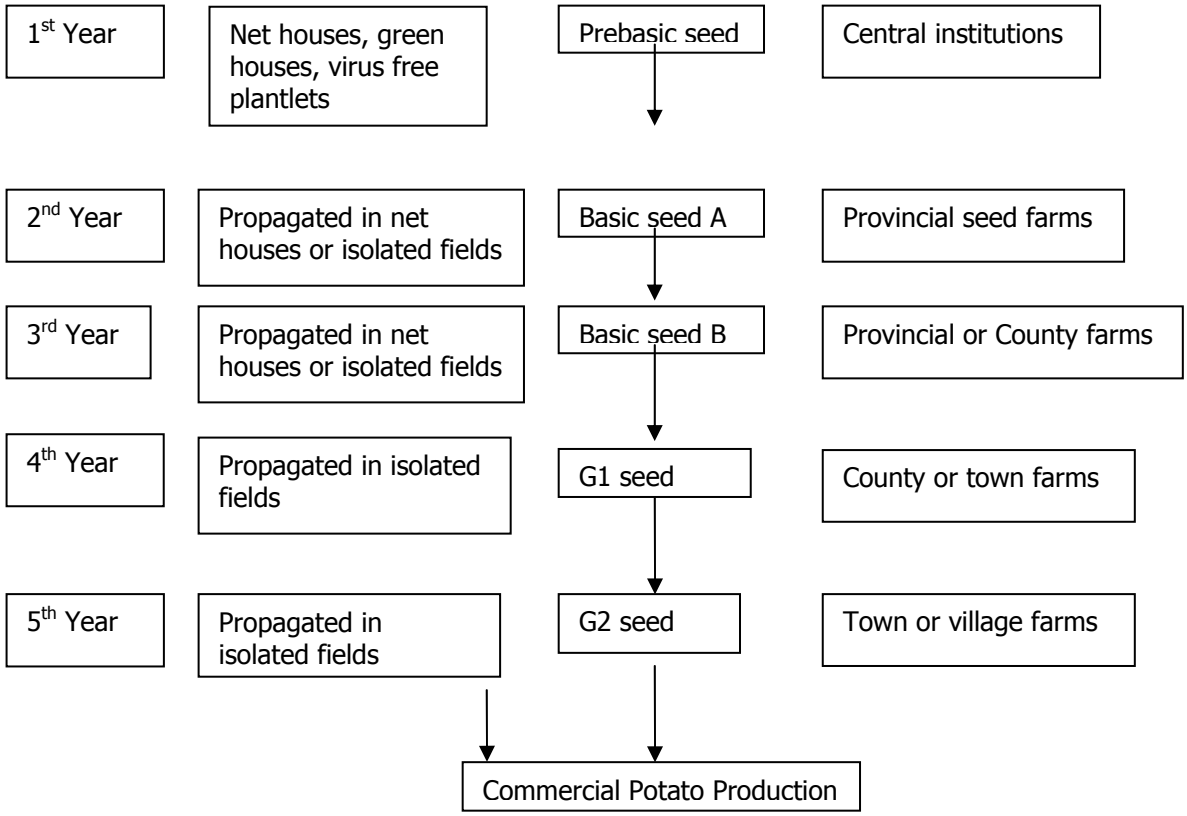
Currently most farmers are using carryover seed. Not yet able to coordinate and manage an organisation for the regulating of certified seed. If 50% of Chinese farmers use certified seed then this would require;

- 200,000 – 300,000 hectares of certified seed
- 2,000 hectares of prebasic seeds or 150 to 180 million minitubers (75,000 to 90,000 minitubers/ha)

Technology required in China for seed potato production

- Technology for virus elimination and rapid multiplication (low cost?)
- Minituber production (new methods such as hydroponic)
- Technology for certified seed potato production – disease control, uniform size of seed.

Seed potato production system in North China



Pest control for seed potato production

- Important diseases in seed potato production
  - Late Blight, ring rot, bacterial wilt (in South/ Southwest China)
- Important insects in seed potato production
  - Aphids, other leaf eating insects, underground insects (grubs, cutworms etc.).
- Chemical control available for;
  - Late Blight and aphids and other insects

Problems

Low market prices. Farmers have difficulty in selling their potatoes while also processors are short of produce. A shortage of mechanical cultivation tools (esp. in Northern regions for planting and harvesting equipment). Water and fertilizer management – spuds are not traditionally irrigated in the North and only flood irrigated (furrow) in the South, both methods are not efficient for potato production. Disease control research is centred around resistant varieties, certified seed and healthy land. Transportation is a large problem area, with issues such as;

- Poor handling during transportation (large losses)
- Poor packaging
- Long distances (by road)
- No specific potato transportation
- 'Greening' occurring during transportation

Improvements that would like to be implemented in transportation would be;

- Double poly sacks
- Railcars with air-conditioning
- More efficient trucking networks – straight to markets or factory from field.

BIOTECHNOLOGY IN POTATO BREEDING OF CHINA

Presented by: Xie Conghua, Mid China Agricultural University

China is exploring biotechnology as a priority to overcome disease and variety improvements. Chinese consumers are more receptive to GM varieties than other countries. The Chinese industry is being driven by researchers and governing bodies and there doesn't appear to be any public debate on GM that includes the 'average' consumer.

In January 2003, 95 of the 10,643 potato nucleotides sequences registered in Genebank are from China. Current breeding methods are; cloning, molecular marker assisted selection, gene transfer (virus resistance), gene transfer (Agrobacterium).

The market requires potatoes with more specific traits which creates new challenges for potato breeding in China. It has been necessary to broaden the germplasms and exploit new breeding techniques.

Emphasis is being given to GM research into virus resistance and it would seem that progress is being made in this area. Work is also being done on fungi and bacteria resistance.

Starch production is a most important element of the potato industry in China and much attention has been given to improving starch levels. Many varieties with high starch content have been released but starch degradation and reduced sugars under low temperature storage remain as a serious problem to be overcome. Research activity continues to be undertaken on this issue.

In recent years work has been done on Molecular Marker Assisted Selection for late blight and bacterial wilt resistance evaluation. This technology is reported to have also been successfully used for rice, wheat, corn and soybean production.

Comment

This research may be driven by Government and Researchers rather than to be striving to make changes which would be of benefit to the Chinese grower's current needs.

DEVELOPING POTATO INDUSTRY IN INNER MONGOLIA

Presented by: Mr Lei Eerdeni, Inner Mongolian Autonomous Region

Inner Mongolia is the largest potato producing province in China. It is claimed that this area leads the World in some seed development technologies. International collaboration is invited for mutual benefit.

600,000 ha sown area to potatoes for seed, ware and processing. There are over 100 storage facilities each with a total of 1,000 t capacity.

Potato production for Inner Mongolia is stated to be emerging as one of the most important industries in the area, and further rapid development is expected in the coming years.

Comment

An element of caution needs to be maintained regarding the claim that the Inner Mongolian area is the world leader in seed propagation techniques. Evidence suggests that caution should be taken with material (germplasm exchange) that has intellectual property value.

OVERVIEW OF TRANSGENIC POTATOES AND THEIR BIOSAFETY IN CHINA

Presented by: Ni Ting, Beijing University

Gene transfer started in China in the 1980's and developed quickly under the 'High-tech' policy. Pest resistant cotton with Bt gene and long-shelf-life tomatoes with reverse EFE gene have passed the safety test and been released for commercial production. There are many other crops (rice, potatoes etc) that are currently undergoing biosafety testing prior to release. Research on GM potatoes has been focussed on virus, bacteria and fungal disease control and variety improvement.

The speaker stated that there was need to maintain strict regard for the safety of transgenic crop development. Further transgenic research was intended leading to the release and commercialisation of transgenic varieties

China has aspirations to produce internationally competitive seed potatoes by developing new technologies.

China is proceeding with the development of a minituber production industry aimed at export. Currently, there is only a limited market for this technology in Australia. There could be the possibility of learning about the fast propagation techniques from the Chinese that may improve the Australian minituber production system. China has a problem with a consistent quality control with minituber production.

CURRENT STATUS OF POTATO PROCESSING SECTOR IN CHINA AND THE WAY OUT FOR FUTURE DEVELOPMENT

Presented by: Liu Wengxiu, Chinese Academy of Agricultural Mechanisation Sciences

Starch production is growing at a rapid rate in China due to a recent 20% increase in demand. The French fry industry is growing slowly which is mainly due to a lack of infrastructure. Other processed products include crisps, potato snacks and granules.

Potato processing is regarded as a sunrise industry and only emerged in the 1980's. Although the area planted is nine times the USA and 16 times Germany, yields are only one third of developed countries.

It is noted by the Government that potatoes grown for processing will be expected to be of great importance. There appears to be a view that processing potatoes will assist in alleviating rural poverty and add to the national economic development of China.

With the lack of cold chain management infrastructure and knowledge, processing facilities, storage, and agronomy skills, the French fry industry in China will not pose an immediate threat to Australian producers. However, potential exists and this is reinforced by the major processing companies all having a presence in China. This presence exists in a financial investment in developing agronomy skills at the most basic, up to the level of investing in processing plant infrastructure.

China definitely need to improve quality and traceability to keep up with international practices and continue to increase exporting into the world market.

AGRICULTURAL TOUR – TUESDAY MARCH 30

A group of Australian delegates joined the Agricultural Tour to a large potato research farm, located approx. 2 hours drive southwest of Kunming.

The farm occupied an area in excess of 20 h at the foothills of a large mountain range, and is used primarily to conduct field tests of different varieties. A reception point was set up in the middle of the farm, and guests were officially welcomed with a short reception and speeches by local government officials.

After the welcoming, tour participants were free to walk around and inspect the potato crop. The crop was generally growing well, with few insect, pest or weed problems obvious in the area near the reception point, however it appeared that further away from the reception point, disease and weed issues were more problematic.

There were no potato plants dug up to allow tour participants to inspect the tubers, however a few of the tour participants did dig up a couple of plants for a quick look.

There were many workers located throughout the crop carrying out activities such as hand weeding and scooping water out of the irrigation furrows onto the plants. It appeared each plant received one scoop full of water, with each scoop approx. 750-1000ml. A mixture of organic and inorganic fertilising materials are used to produce the crop, although exact levels of the nutrient inputs were not given.

Conclusion

The tour was an interesting drive through southwest China's countryside, and offered a good opportunity to inspect a large potato crop in full production. Particularly noteworthy was the opportunity to witness China's intensive, hands-on crop production technique.

REPORT OF THE VISIT TO THE HEILONGJIANG DEPARTMENT OF AGRICULTURE, HARBIN

Friday April 2 2004

Principal Representative: Mr Jiang Huailian
Deputy Director
Division of International Economic Cooperation
Agriculture Committee of Heilongjiang Province

- The Province is a major production area for China
- China grows 65 million tonnes of potatoes, 25% of the world's production, largest producer in the world
- Province grows 1/10th of China's production, about 6.5 Million Tonnes
- Average yield 15T/ha, a bit higher here than the average for the rest of China. Noted to be well below the average yield for Holland
- Have a cooperation linkage with CIP and with a United Nations Development body
- Working with USA, Canada, Holland, France and Britain. CIP linkage is important. CIP has an office in Beijing.
- Interested in importing new varieties
- Have an interest in machinery, chemicals and fertilisers
- The province wants to cooperate with other countries to gain new varieties, training and new technology
- Would like to cooperate with Australia and South Africa in the future
- No irrigation used for potatoes grown in the Province. Annual rainfall 500mm/annum. Most rain falls in July/August which is also the warmest time of the year.
- Late Blight is the main disease problem
- Research activity currently includes new varieties, organic production, seed breeding and disease prevention
- No information available on the level of spending on research – 'hard to tell'
- Plant density is 60,000/ha for dry land farming
- Market price applies to sales to processors
- Fresh market potatoes are sold to the south of China through agents
- The province is at Latitude 45 North
- Minus 30C is the lowest winter temperature
- There are no plans to become involved with irrigation in the future
- The days from planting to harvest range from 60 to 120 days
- The Province has 3 starch factories, one dehydration plant is under construction and also has a noodle potato plant. Another product is instant frozen – exported to Japan.
- It is intended to expand potato production in the Province
- Other crops grown include wheat. Soy beans, and maize
- Potatoes have a three year rotation

Recommendation

As far as is practical, Australia should monitor what is to happen in the future with potato production in Heilongjiang Province.

ORGANIC CHINA

Observation from John Rich, Executive Officer, Tasmanian Farmers and Graziers Association

The Chinese version of organic would appear to be significantly different to the position generally adopted by the Western World for organic production.

Organic in China seems to mean low or reduced pesticides having been used on the crop. A comment was made which indicated that the Chinese population believe "organic' to mean 'healthy, no farm chemicals'.

Another version of 'organic' exists in China and this is called 'green vegetables'. It is thought that this could be closer to the Western version of organic production. No comments were made to indicate that 'green' potatoes were being produced.

It is interesting to note that a potato seed production company which was visited is called the Harbin Oriental Green Seed Co. The President of this company, Mr Leon Liu, stated that he was interested in considering true organic production. This could suggest that 'green' is still not organic according to Western standards particularly having regard for the need to use 'Ridomil®' and 'Mancozeb®' for Late Blight control.

It can be assumed that organic production in China is not in accordance with Western standards.

Recommendation

It could be appropriate for Australian Government representatives during relevant future discussions to establish what the term "Organic" means to the Chinese public and to Chinese producers. What rules are in place and who monitors the system?

HARBIN ECONOMIC DEVELOPMENT ZONE (HDZ)

April 7, 2004

Mr Feng Yaodong – Deputy Director HDZ
Mr Sun Tie Li – Vice Director HDZ
Ms Ren (Ronnie) Wenxia – Deputy Director HDZ
Mr Leon X. Liu – President, Harbin Oriental Green Seed Co. Ltd.

- There are 49 economic development zones in China plus four high tech zones
- The Harbin zone is now a combination of economic and high tech.
- Foreign investment encouraged and managed through the HDZ
- Four major industries in Harbin are in food, pharmacy, auto and high tech
- Harbin is the largest city in northern China and agriculturally very important. There are 37 million people in the Province.
- Potatoes are now the main staple food product
- A few potato processors are interested in making an investment in French Fry production. (Names were not divulged but it is known that McCains have been active for around 10 years in Harbin)
- Process potato trials have been successful, may start French Fry potato production soon
- Farmers income about 1/20th of Canadian potato farmers
- Want investment in the region and will assist any potential investors
- Plan to improve technology uptake for farmers
- Transportation is important – have access to other regions in China and close to Russia and Korea. However, cool-chain is non existent at present.
- French Fry exports could potentially go to Russia, Korea and Japan.
- Russian border is only 900km from Harbin
- Palm oil would need to be imported for French Fry production (Malaysia?)
- Potato varieties are grown for the local fresh market, although some 'Atlantic' is grown specifically for crisping
- Have enough water supply, not advanced with irrigation, therefore yields are not high
- Have very cheap farm labour costs – about 20 yuan/day (about $Aus3.50)
- Farmers only have a few Mu to farm – 1 mu is 1/15th of a hectare
- Very little use of mechanisation at this time
- Don't use a lot of chemical fertilisers
- Expect to have a McCain processing plant operating within two years.
- Emphasis is being given to seed production, varieties are Russet Burbank, Kennebec, Ranger Russett
- It appears that Frito Lay also have an interest in the Harbin region
- Farmers are low input – efficiency through technology is required
- Late Blight is a problem – 80% of the regions potato crops were affected last season
- No storage facilities at present but under consideration
- Potatoes currently stored in underground cellars – prefer good western style storage methods
- Potatoes are mechanically lifted then picked up by hand
- Simplot have a factory in Beijing and are trying to grow in other areas

- The manure being used is 'sort of' organic
- Farmers have to change from saving own seed
- No seed certification scheme currently in place

Conclusion

There are many challenges for the potato growers if they are to lift yields and quality in order to meet the expectations and requirements for potato processing

It would be expected that the Harbin area growers will make improvements and will respond to improvement encouragement

Harbin is encouraging foreign investment.

Appears to be a problem with year round supply of product for processing – factories closing down for half the year due to lack of storage.

Area has potential to be an exporter of product if they can overcome some major production and infrastructure hurdles. This will not occur in the short-term.

Recommendation

Continue to watch potato production and industry developments in the Harbin area.

VISIT TO TECHNICO, KUNMING

March 25, 2004

Technico, head office in Moss Vale NSW and with Chambal Agritech being the majority shareholder (54%) has established branches in the USA, Thailand, Mexico, India and China.

A group of 22 Potato Congress participants visited Technico Horticulture (Kunming) Co. Ltd. The tour group was shown through the company laboratory facilities used for the production of minitubers. The Technituber® seed can be produced at a rate of over 10,000 seeds/m^2.

The visit was arranged through David McDonald from Technico, New South Wales and George Gocze, Technico's China CEO. Appreciation is recorded for the assistance provided by Technico for this visit.

MEETING WITH CHINESE ACADEMY OF AGRICULTURAL SCIENCES, BEIJING

6th April 2004

Professor Dongyu Qu, Vice President CAAS

- The Academy has 41 Institutes covering all agriculture except Forestry, which is a separate Institute.
- Have more than 16,000 staff, including 7,000 part time, retired people.
- All Institutes are legal entities and can deal with anyone, stated to be "decentralisation".
- Emphasis was given to "International Collaboration and Exchange" – always need to talk with people on the ground – farmers. China is looking outwards now and scientists are encouraged to meet with growers. Collaborating with USA Farmers Association.
- "Incubator" system operating to further develop agricultural sciences and leading to the establishment of small high tech companies.
- With over 9,000 skilled scientists, the Academy wants people to work with others around the world. Scientists are encouraged to work and study in other countries. One of the mission is to be a "Cradle for Young Promising Scientists.
- The statement was made that "sooner or later, Australia will depend on the Chinese Market." Reference was made to agricultural production being in opposite seasons for China and Australia.
- The Academy is keen to send students to Australia to learn from experienced Australian growers.
- It was noted that the Academy is aware that the average age of Australian farmers is increasing and that young people are not staying on the farms.
- Agriculture in China is progressing, the open door reform policy is working, the value of agriculture as a % of the GDP is increasing and it is recognised that there is still a long way to go relative to the total population.
- There is an indication that some crops are now being overproduced and China is looking to the export trade to take this surplus. Reference was made to Free Trade Agreements being established with trading partners.
- Whilst most cropping production is increasing there is also an indication that domestic consumption is increasing. Vegetables production remains as an important cash generating activity.

- It was stated that milk production is expected to increase dramatically in future years.

- The Challenges facing Chinese agriculture were identified as follows: quantity, quality, diversity, safety and security, competitiveness, environment and sustainability.

- The fast food industry is increasing in China. (Time Asia Magazine Nov 24, 2003 reports that KFC opened in China in 1987. It now serves over 2 million customers each day through 900 KFC restaurants, with at least one new outlet opening every other day. McDonalds commenced in 1990. The Enquirer, dated 16th January 2004, reports there are over 560 McDonalds restaurants now operating in China and that 100 new stores are to be opened during 2004.)

- The Australian group was invited to consider the question, "What advantages does Australia have?"

- There is much pressure on the Chinese environment and it was noted there can be a contradiction between increasing food production and protection of the environment.

- The future will involve, technology development and commercialisation, ensuring farmers are up to date with modern practices and encouraging training for farmers.

- More machinery is being used for planting and harvesting. Machinery will be shared and contractors will be encouraged.

- Young people are not staying on the farms and this is seen to be an issue of concern. (The implication being that the returns from the business of farming in China are not enough to keep young people on the land.)

- Technical improvements will include: quality, diversity in variety, processing, consumption and appearances, safety through genetic modification, hygiene, convenience.

- Genetic modification will continue with serious laboratory work being done. Consumers need to be advised if a product has been genetically modified and there needs to be consumer acceptance. The general view is that Chinese consumers are neither "too far left" or "too far right" about GMO's.

- There is a clear need to develop and establish a cool chain infrastructure in China. A major conference will be held in Shanghai in May to consider supply chains issues

- Technologies for the potato industry. Moderm breeding, intensive cultivation, bio technology, safety inspection and monitoring, improved resource utilisation, environmental; control, processing, information to producers – digital technology.

- Many local farmer associations, not political, mostly for information exchange.
- 90 million farmers grow potatoes, need to improve incomes, not enough money now.
- It was stated that "Technology Is the Torch For Agriculture."

Conclusion

- The Chinese Academy of Agricultural Sciences would appear to be a progressive organisation, intent on encouraging the continued improvement and further expansion and development of Chinese agricultural enterprises. China would always be expected to require a massive food production program in order to be able to feed their 1.2 billion population.

Recommendation

- Australian horticulture leaders, should establish lines of communication with the Academy of Agricultural Sciences. (It was understood that this was the first Australian Potato Industry group to visit the Academy.) There would seem to be opportunities to exchange information of mutual interest and there may be opportunities for collaboration on a range of research activities. Consideration could also be given to the encouragement of researcher visits.

VISIT TO CHINESE ACADEMY OF AGRICULTURAL SCIENCES (CAAS) INSTITUTE OF VEGETABLES AND FLOWERS

April 6, 2004, Beijing

Mr Xie Kaiyun – Potato Expert CAAS

- Potatoes have been grown in China since the year 1550
- North and South West China accounts for 85% of Chinese production
- China has 4.719 M Ha of potatoes – (1992 was 3 M Ha)
- Yield in 1992 was 12.5t/ha, in 2001 it was 13.7t/ha
- Production in 1992 was 37M tonnes, in 2001 it was 65 M tonnes
- Current average yield is considered low – and yields range from 6.2t/ha (Shanxi region) up to 29.8t/ha (Shandong region).
- The top ten production regions (planted area) have yields ranging from 6.2t/ha to 16.3t/ha. The average yield for the top ten areas is 12.5t/ha
- There are 22 production regions in China
- Yields will increase in the future due to improved seed quality, better pest control and new varieties.
- Potato usage,

Food	30%
Animal feed	30%
Seed	8%
Process (mainly coarse starch)	22%
Others	10%

Note: small % used for French Fry processing

- Potatoes are the 5th crop after rice, corn, wheat and sweet potatoes
- Consumption is stated to be 14.5kg/capita/year
- The area of China is 9.6 M Km² with 130 M Ha of arable land
- Potato production will also increase as a result of 'reconstruction of agriculture'.
- It is planned to stimulate the potato processing industry
- 8.5 M tonnes of seed is needed to plant 1.6 tonnes/ha for 4.72 M Ha
- 400,000 to 600,000 Ha are needed for seed with a yield ranging from 15 – 20 t/ha
- Seed is grown mostly in northern China
- Minitubers are now produced everywhere but quality is doubtful
- There is currently no seed certification system – will be established.
- Anyone can grow seed at present, no registration system in place
- 150 to 180 million minitubers would be required if 50% of farmers were to use certified seed
- There are plans to export seed in future when size and quality are improved
- Some minitubers are being produced by aeroponics
- Coarse starch is the major processed product – about 20% of total production is used to produce potato noodles
- Simple coarse starch extraction method on farm is to squeeze and strain potato pulp. Residue is used to feed animals.

- There is an increasing need to move to refined potato starch, requiring between 350,000 and 400,000 tonnes to be produced. Current production around 100,000 tonnes. Require high starch varieties.
- The crisping industry began in the 1980's and by 2002 there were 10 crisping factories.
- Raw material is only about 100,000 tonnes. Main variety is Atlantic.
- Foreign crisping investors are from USA, Phillipines, Japan, and Taiwan, – mostly located along the coastal areas.
- Crisping requirement will increase
- Simplot commenced French Fry production in Beijing in 1992 – about 3,000 tonnes
- After 10 years production has increased to around 20,000 tonnes
- Most French Fries are imported by McDonalds & KFC – about 100,000 tonnes and expanding.
- The demand for French Fries will increase as more fast food outlets are opened
- There is a growing market for dehydrated potatoes – flake and granule
- The aim is to replace imported produce with locally produced flake and granules
- China has about 40 research institutes employing between 200 and 300 scientists involved in potato research
- More attention will be given to processing, transportation, storage and packaging
- National standards in place or being developed include starch, virus-free seed, virus detection, quarantine, seed production, food and hygiene, pesticide use
- Future standards to be developed, processing, storage, transport and registration of seed growers
- International cooperation countries include Holland, USA, Canada, France, Italy, Belgium, United Kingdom.
- Cooperative involvement covers on-farm, technical, machinery, processing, irrigation and harvesting machinery.

Conclusion

Chinese potato production will continue to increase and all aspects of production will be expected to improve. There appears to be a rapidly growing local demand for processed potato products. At this stage, it would appear that the industry will need to take some gigantic steps forward if it is to meet its processed product aims. There will be major challenges to be overcome for the industry to meet these objectives.

EFFECTS OF CLIMATIC CHANGES ON THE WEATHER AND IMPLICATIONS FOR GLOBAL PRODUCTION

Presenter: Dr. Robert Hijmans, USA.

The world climate is changing at an exponential rate, average temperatures will increase 1- 5 C by 2050. Largest rises will occur at higher latitudes and this will impact on potato production in these regions and the industry will need to adapt to counter these changes.

All models on climate change point to an increase in average temperatures over the next 100 years. These changes will not occur evenly over the globe and specific regional peaks are hard to predict. More significant climatic changes will probably occur in the Northern Hemisphere than in the Southern.

Potato production is adaptable. In countries where double cropping is practiced (potatoes or potatoes and grain/year), the higher predicted temperature would be beneficial – shorter growing seasons. The warm areas of the Northern Hemisphere could suffer significantly if new varieties are not bred to tolerate the higher temperatures. It will be important to anticipate the problems and adaptation needs to be quick.

A predictive model was developed based on 5 cultivars, estimations of best practice, with and without adaptation in current potato regions. Yield declines without adaptation could reach 25% by 2050. Climate change will also impart pest and disease distribution, however, these are more difficult to predict. The key message is to be prepared, as change is on the way. With water use efficiency we need to be more creative in our approaches to water recycling.

Recommendation

Australia should focus on breeding and selecting varieties with shorter growing season, greater heat tolerance and lower water requirements. Examine other agronomic practices to ensure they fit with climatic change. Global changes in patterns of planting may provide opportunities for the Australian industry.

- Direct correlation between rising temperatures and CO2 levels
- Next 100 years could see temperatures rise between 1 and 5 C
- Many new areas may become warm enough to grow potatoes
- Pest and disease occurrences will also change
- Carbon levels are increasing too quickly
- Adaptation will need to be quick and likely to be costly

WORLD WATER SUPPLIES - ARE THEY ADEQUATE?

Presenter: Ian Makin, Thailand

World water supplies will be adequate if they are managed properly. Agriculture is and will remain a huge user of water and will need to adapt. World water quantity is fixed at 43,000,000 cubic kilometres of fresh water and 80% is used in agriculture.

- Sept. 2002 – 2 billion people faced severe water stress
- Water flows to where the money is
- There is sufficient water in the world but a lot of it is either unsuitable or unavailable.
- Less than 1700c metres of water per person = moderate stress
- Less than 1,000c metres of water per person = severe stress
- If annual river flow take exceeds 20% = moderate stress
- If annual fiver flow take exceeds 40% = severe stress
- Must reuse/recycle more water
- A family meal of rice equates to 2000 litres of water (potatoes are a little better)
- High water crops such as rice may need to be phased out for more water efficient crops such as potatoes
- Slogan: *More crop per drop*
- Greater economic justification will be required prior to allocation of water.

Implications for Australia:

- Public education on agriculture's need for water
- R&D into efficient water use systems continues
- Lobbying of politicians on the 'public good' of water schemes and continued access for agriculture
- Prioritise water use – food production must be a high priority. Current priority is human consumption, industrial, agriculture & environment.

GLOBAL INITIATIVES IN LATE BLIGHT

Presenter: Dr. H Platt, Canada

Global initiatives in Late Blight (GILB) is an information network linking researchers, breeders, growers and industry. It promotes the sharing of late blight information. The impact of the sexual strain of late blight will be sudden and severe for certain regions of Australia (particularly Tasmania) and greater preparation is required now before it is detected.

Late Blight infestations now costs the global potato industry US$3.25 billion/year in developed countries. Equating to a 15% loss of crop.

Breeding for resistance is currently the best option.

Implications for Australia:

- Australian organisations should become members of GILB
- Promotion of the GILB website (http://www.cipotato.org/gilb/) to the Australian industry
- Agronomists should be well-prepared to identify and quickly respond
- Host plants in Australia should be identified

REGIONAL REPORTS

Presenters: Various

Eastern block countries are the highest consumers of potatoes – Belarus highest in the world. Increases in production have centred on improved seed production and availability.

Expected increases in Asian consumption to be strong, while growth in Europe, Nth & Sth America is likely to remain stagnant. Eastern European countries joining the EU tend to consume less potatoes and move to value added products to consume. Great Britain has a 50% fresh and 50% processed potato consumption market. Production in Africa is heavily linked to water availability and also has the potential to increase consumption.

Consumption of fresh potatoes is stagnant or falling whilst processed consumption is increasing – this will keep overall production on the increase. Many countries regard breeding and availability of quality seed as the major limiting factor for industry growth.

The world requirement for high quality seed offers potential for Australian companies to develop better breeding and seed production systems and export this seed and technology to regions such as Africa and Eastern Europe. Exporting knowledge from Australia could offer opportunities for the processing sector.

Mexican area of production has not increased over the past 20 years however the yield/ha has doubled.

Canada has seen a 50% increase in area planted and 60% increase in production over the last 20 years.

The USA has seen a 17% increase in area planted and a 60% increase in production over the last 20 years. Fresh potato imports have exceeded exports, however, frozen products exports higher than imports – but trend is reversing.

Comment

There appears to be a definite shift from fresh potato consumption to both processed and value added potato products. Australia is well placed to take advantage of this trend. Using the available technology and resources, the prospect of gaining access to additional export markets for value added products would seem to be a real objective and possibility.

BRITISH POTATO COUNCIL – PAST AND PRESENT

Presented by: Mr David Walker, U.K.

The grower based Potato marketing Board has been replaced by an appointed industry body with no regulatory powers.

- Whole of industry body, funded by growers (85%) and trade purchasers (15%)
- Appointed Board of 16 (9 producers)
- Reviewed every 5 years by Government
- Mission: To stimulate, develop and promote Great Britain's potato industry
- Vision: An industry body that is open minded, innovative and actively working together for common goals
- Role: To prioritize issues, oversee cultural change, ensure customer service and satisfaction, coordinate supply chain and business development.
- Supermarkets are powerful and dictate to the smaller players

Recommendation

Australian industry should develop closer links to the BPC to gain knowledge on marketing, new product development, and develop synergies with R&D projects.

CHANGING TO MEET CURRENT NEEDS

Presented by: Niel Theron

- Major political changes in South Africa in the last decade
- Multinational companies now involved in South Africa
- More private enterprise and less government support
- Statutory funding has been discontinued and this means funding problems for farmers and farmer organisations
- Because there is no official farmer body, the multinational companies are able to negotiate one on one in South Africa
- Potatoes South Africa has been established by potato producers to manage user oriented research including seed
- Three core businesses – research, market development and product promotion, information systems
- Funded by voluntary levies ranging from 63c/t to $2.20/tonne

Farmers need to take a political interest in their industry to prevent unfavourable treatment by Government.

GLOBAL TRENDS IN DEMAND, PRODUCTION AND RESEARCH

Presented by; Dr Hubert Zandstra, Peru

Population growth = food growth. Potatoes have the ability to supply much of this food requirement.

Main population growth will occur in developing countries (95%). The growth is estimated to be around 100 million per annum and this will most likely occur in Asia and Africa. Approximately 1.2 billion rural people are living on less than $1.00 per day. Only about 4% of potatoes are traded worldwide and this % is expected to increase in the coming decade.

It is suggested that around 50% of the increase in production will come from increased area and 50% from reduced losses and yield increases.

The 2001 world average yield for potatoes was 16t/ha. There is therefore huge potential for improvement through,

- Clean virus free seed
- Improved varieties for lower inputs
- Virus management and eradication
- Late blight research
- Bacterial Wilt management and control (currently estimated 1.5 million hectares infected)

Potatoes have a harvest index of 75% - 85% (more than 50% higher than grain). It is claimed that the highest potential yield for potatoes, with no constraints, is 120t/ha.

Recommendation

Opportunities exist for Australia to export clean seed and processed potato products. World french fry trade is growing at 13% per annum – maybe an opportunity. Fresh trade is on the decline and highly volatile, especially with China and India currently having a surplus to domestic consumption. Potential for partnerships in production and later marketing in developing countries.

BIOTECHNOLOGY: ITS ROLE IN FUTURE GLOBAL POTATO PRODUCTION

Presented by: Dr Nigel Kirby, U.K.

33% of the world public funds spending on Biotechnology will be in China. Farmers will be the main benefactors of biotechnology.

Biotechnology will be a major factor in future potato production. It is the 4th most important food crop in the world consumed by 1 billion people.

67 million ha of GM crops are now grown on 7 million farms in 18 countries.

- 55% of the world soybeans
- 21% of the worlds cotton
- 16% of the worlds canola
- 11% of the worlds maize

Generating $4.7 billion in licences and seed sales
20% of potato potential is lost to disease.

Research shows;

UK consumers will pay 50% more for GM free food
Japan consumers want 50% discount for GM foods
China will pay 50% more for GM foods.
Monsanto has a PLRV variety available.

Comment

Gaining acceptance of GM is a monumental task for Australia. Negating the 'Frankenstein' image and emphasising the advantages of GM from a sustainability and environmental perspective will be challenging.

ENVIRONMENTAL AND FOOD SAFETY ISSUES OF GM POTATOES

Presented by: Tony Connor, New Zealand

GM risks are no different than traditional breeding. Quote from Luther Burbank (breeder of Russett Burbank) in 1906; *'We have learned to manipulate life as never intended by nature – proceed with the utmost caution.'*

GE is very important and necessary in potatoes. GE is more accurate and measurable than breeding. DNA of the potato will be mapped within 6 years.

The anticipated result is to have higher quality, blemish free tubers, with reduced chemicals applications, as demanded by consumers. The public concerns being expressed in opposition to GM would appear to have little scientific substance

Caution not to make potatoes more of a weed than they already are. 24 species being used in potato breeding. Only one per million seedlings will be released as a new cultivar. Estimated that 376,000 tubers/ha (viable) are left in the ground after harvest and can persist for 1 -2 years.

It is concluded that any risks posed by the release of GM potatoes are similar to those posed by traditional breeding of new potato cultivars. Cultivars derived from either method require extensive testing as is routinely carried out in modern potato breeding programs.

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John Rich
Project Leader