2014 Team Activity

You are a potato producer in the Spud Belt.
Everyone in the area produces the one variety of potato that all the national fast food restaurants purchases for their French fries.
There is a virus that attacks this particular variety and rots the tuber before it can be harvested.

As a member of the potato coalition you must bring a plan of action to confront the issue facing the producers to the local Potato COOP in charge of planning and marketing.

Teams will be required to develop both an oral, as well as a written statement that addresses the questions in the scenario.
Teams will submit a written summary of their findings at the end of 1 hour.
You will save these to the jump drive provided and the written summary will be printed for you.

Use the materials provided to present your plan of action.

International Year of the Potato 2008

Potato and biodiversity

By conserving – and utilizing – the potato genetic diversity developed by their ancestors, small farmers in the Andes are helping ensure world food security

Key points

- Potato farming systems need a continuous supply of new varieties drawn from the entire potato gene pool.
- Potato biodiversity is under threat – ancient varieties cultivated for millennia have been lost and wild species are threatened by climate changes.
- Smallholder farming systems in the Andes encourage cross-pollination of potato flowers, vital to sustaining the diversity of local, farmer-developed varieties.
- With CIP support, Andean communities have created a "potato park" holding some 1 200 traditional varieties of potato.

The history of the potato provides a grim warning of the need to maintain genetic diversity in our staple food crops. In the 19th century, Ireland was heavily reliant on only a few varieties of potato, and those types contained no resistance to the devastating disease known as late blight. When late blight destroyed the 1845-1846 potato crop, widespread famine followed. An estimated one million people starved to death and more than a million were forced to migrate abroad.

To combat pests and diseases, increase yields, and sustain production on marginal lands, today's potato-based agricultural systems need a continuous supply of new varieties. That requires access to the entire potato gene pool. But potato biodiversity is under threat: ancient varieties cultivated by Andean peoples for millennia have been lost to diseases, climate change and social upheaval.

Species and crop-associated diversity

While most varieties of potatoes belong to a single species, *Solanum tuberosum,* about 10 other *Solanum* species have been cultivated, and 200 wild species have been recorded. Climate change may threaten the survival of those wild relatives: it is forecast that as many as 12 percent will become extinct as their growing conditions deteriorate. If climate changes drastically, the area where wild potatoes grow naturally could be reduced by as much as 70 percent.

Farmers sort varieties at Peru's "potato park". Photo: © CIP

Centre of origin

In the Andean region, generations of farmers have domesticated thousands of potato varieties. Even today, farmers cultivate up to 50 varieties on their farms. In the biodiversity reserve of the Chiloé archipelago in Chile, local people cultivate about 200 varieties of native potato. They use farming practices transmitted orally by generations of mainly women farmers.

Since potatoes mostly propagate vegetatively, most commercial varieties of potato have a reduced ability to flower and breeders do not select for traits that make the flower attractive to pollinators. However, natural potato pollination remains important to sustaining the diversity of land races (farmer-developed varieties that are adapted to local environmental conditions). Fortunately, the diverse smallholder farming systems in the Andes harbour a variety of flowering plants that do attract pollinators, such as honeybees and bumblebees, which promote cross-pollination of potato flowers, thus increasing seed production and sustaining diversity.

International Treaty

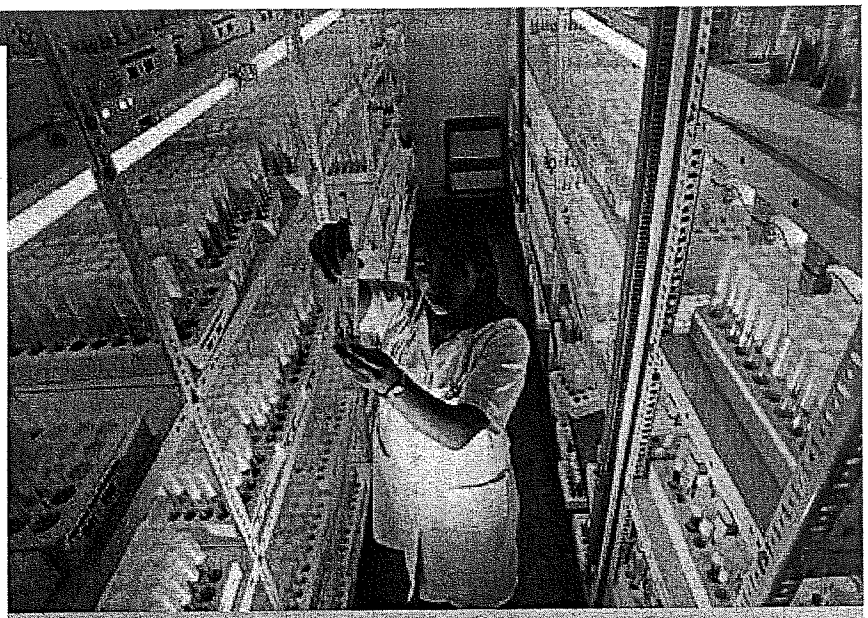
The potato is included in the multilateral system established under FAO's International Treaty on Plant Genetic Resources for Food and Agriculture.

The Treaty, which entered into force in 2004, aims at the conservation and sustainable use of crop plant diversity and the fair and equitable sharing of benefits derived from their use.

Conserving potato biodiversity in the Andes

Having lost many of their traditional potato varieties, Peruvian farmers in the Andes are now taking measures to conserve and sustainably use those that remain. A pact has been signed by six Quechua communities with the International Potato Center that recognizes the rights of the communities over potato strains they have developed.

Under the agreement, the Center's genebank returns potato genetic resources – and knowledge associated with them – to the communities, which have established a "potato park" (*Parque de la papa*) in a conservation area where they grow and manage the plants. This repatriation of biological diversity effectively keeps control of genetic resources local. The 15 000 ha park is a "living library" of potato genetic diversity, holding some 1 200 varieties of potato cultivated in the highlands. A long-term goal is to re-establish all the world's 4 000 known potato varieties in the valley, allowing the park to function as a second centre of origin for this vital staple crop.



Inside CIP's gene bank. Photo: © CIP

Diversity conserved in trust

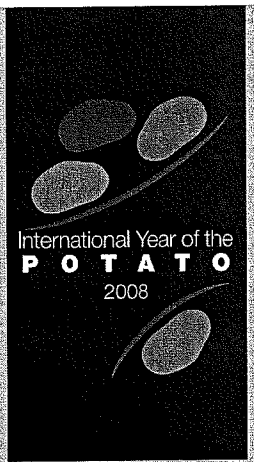
The International Potato Centre in Peru maintains the world's largest bank of potato germplasm, including some 1 500 samples of about 100 wild species collected in eight Latin American countries, and 3 800 traditional Andean cultivated potatoes. The collection is maintained and managed under the terms of an agreement with the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture and, like all collections eligible for funding from the Global Crop Diversity Trust, is available to plant breeders worldwide upon request.

Credits:
Information provided by the Global Crop Diversity Trust and the Plant Production and Protection Division, FAO.

About IYP 2008

The **International Year of the Potato**, to be celebrated throughout 2008, aims at raising global awareness of the potato's key role in agriculture, the economy and world food security.

www.potato2008.org



HIDDEN TREASURE

www.potato2008.org

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GMO potatoes: Is the biodiversity shortcut worth it?

By Twilight Greenaway (http://grist.org/author/twilight-greenaway/)

1 Aug 2012 4:31 PM

A protest against GMO potatoes. (Photo by BASFPlantScience (http://www.flickr.com/photos/48876243@N08/4621411873).)

Last week's announcement that Ireland's environmental protection agency approved the nation's first trial of the genetically modified potato has reactivated the conversation about the spuds, which have actually been kicking around Europe — on a trial basis — since 2010.

Potatoes are an industrial crop; we grow nearly as many of them worldwide as we do corn, soy, wheat, and sugar, and those industries all rely heavily on genetic engineering. And — like corn, sugar, and soy — potato starch is now often valued for its indirect uses, such as in animal feed and biofuel. So it's not surprising that industry forces would be pushing for giant swaths of industrial-starch-producing GMO potatoes. But to do so in Ireland would involve a unique historical irony.

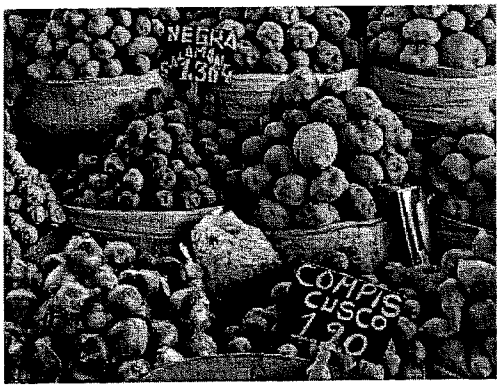
You see, it just so happens that the Irish potato famine of the 19th century is held up as one of the most striking examples (http://aboutbiodiversity.org/agbdx/eireblight.html) of the way monocrops — those grown with little or no genetic diversity — are vulnerable to disease. Heralded as a miracle when it arrived from South America in the 1800s, the potato produced more calories per acre than wheat and corn, and virtually did away with the mass-scale hunger many European countries were facing at the time. (Some say it was the potato that made European nations into world superpowers, and its cultivation also marked the beginning of today's industrial agriculture model.)

Because farmers were only growing very few potato varieties at a time, however, Europe — and in particular Ireland — was an easy target for disease. As historian Charles Mann wrote in *1493: Uncovering the New World Columbus Created* (http://www.powells.com/biblio/9780307278241?&PID=25450), excerpted here in *Smithsonian* magazine (http://www.smithsonianmag.com/history-archaeology/How-the-Potato-Changed-the-World.html#ixzz22J7dBL2L):

> In two months [a fungus called] *P. infestans* wiped out the equivalent of one-half to three-quarters of a million acres. The next year was worse, as was the year after that. The attack did not wind down until 1852. A million or more Irish people died — one of the deadliest famines in history, in the percentage of population lost. A similar famine in the United States today would kill almost 40 million people.

All this makes potatoes a powerful symbol of biodiversity (and lack thereof) in the global food system. But to read this week's news, it's easy to wonder if we'll ever learn our lesson. According to a BBC report (http://www.bbc.co.uk/news/science-environment-19000190), the new GMO potato has been engineered to withstand blight, a dangerous potato disease that "can rapidly turn the vegetable into an inedible mush." Through genetic splicing, scientists say the new potato now has a resistance gene taken from a wild South American potato.

John Spink, head of crop research at Teagasc (http://www.teagasc.ie/), the Irish Agriculture and Food Development Authority that has applied for the license, told the BBC: "You could achieve the same results by conventional breeding, but it might take 15 to 20 years — this way we can do it in weeks."



Potatoes in Peru. (Photo by Eric Miraglia.)

Meanwhile, South American nations have maintained an incredibly diverse array of potatoes. Mann writes that as recently as 1995:

> ... a Peruvian-American research team found that families in one mountain valley in central Peru grew an average of 10.6 traditional varieties — landraces, as they are called, each with its own name. In adjacent villages Karl Zimmerer, an environmental scientist now at Pennsylvania State University, visited fields with up to 20 landraces. The International Potato Center in Peru has preserved almost 5,000 varieties. The range of potatoes in a single Andean field, Zimmerer observed, "exceeds the diversity of nine-tenths of the potato crop of the entire United States." As a result, the Andean potato is less a single identifiable species than a bubbling stew of related genetic entities.

It's highly likely that in a field where you were growing 20 varieties of potato, at least a few of those would be resistant to whatever disease might come along. And I'm guessing that at least some of those 5,000 varieties already contain traits that are similar to the ones from the wild potato that have been genetically inserted in this GMO variety. And yes, a 15 to 20 year time investment in traditional breeding may sound onerous, when compared to the genetic quick fix. But all this makes me wonder: Is it ever worth making an end run around real biodiversity?

The four-year trial in Ireland is slated to be relatively small — two hectares or around five acres — but it will also probably take place in the open air, where cross-pollination with other potatoes is highly possible. In a related article in the *Irish Independent* (http://www.independent.ie/farming/news-features/teagasc-blightresistant-gm-spuds-to-save-growers-450ha-3186170.html), critics pointed to the fact that GMO crops have also been shown to impact other forms of life in the fields. It reads:

> [R]esearch on GM crops in Britain had shown a worrying decline in farmland biodiversity, where numbers of bees and butterflies were found to be 68 [percent] lower in GM fields.

Indeed, that's key to biodiversity — every species lives in relationship to those around it. Potatoes don't grow in a vacuum; and surely the scientists involved know this. But it rarely benefits the companies engineering these products to factor in ecosystem health.

Stella Coffey, an activist who runs a blog called GM Moratorium (http://www.gm-moratorium.com/), told the BBC: "It's absolutely preposterous to use such a risky tech as your first line of action." And she has a point. You don't have to be convinced that GMOs

are inherently unsafe in their own right, or that we should all start growing 20 varieties of potatoes in our backyard (although, if you're a gardening nerd like me, that might sound pretty amazing), to see this tendency for the agriculture community to default to new technology — often simply because it's there and it has the potential to generate revenue for shareholders — as more than a little disturbing. It may not be as risky as it was to feed the whole of nation on just a few varieties of potato in the 1850s, but how can we know that for sure?

Shhh. Did you hear that? I think the ancestors on my Irish side are rolling in their graves.

Correction: This story mistakenly referred to the Amflora potato as being involved in this trial. In actuality, Amflora's trials began in Germany, Sweden and the Netherlands earlier this year (http://www.reuters.com/article/2012/04/05/us-germany-gmo-basf-idUSBRE8340Y120120405).

Convention on Biological Diversity

What is Agricultural Biodiversity?

Agricultural biodiversity is a broad term that includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agricultural ecosystems, also named agro-ecosystems: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem, its structure and processes (COP decision V/5, appendix).

Agricultural biodiversity is the outcome of the interactions among genetic resources, the environment and the management systems and practices used by farmers. This is the result of both natural selection and human inventive developed over millennia.

The following dimensions of agricultural biodiversity can be identified:

1) Genetic resources for food and agriculture:

- Plant genetic resources, including crops, wild plants harvested and managed for food, trees on farms, pasture and rangeland species,
- Animal genetic resources, including domesticated animals, wild animals hunted for food, wild and farmed fish and other aquatic organisms,
- Microbial and fungal genetic resources.

These constitute the main units of production in agriculture, and include cultivated and domesticated species, managed wild plants and animals, as well as wild relatives of cultivated and domesticated species.

2) Components of biodiversity that support ecosystem services upon which agriculture is based. These include a diverse range of organisms that contribute, at various scales to, *inter alia*, nutrient cycling, pest and disease regulation, pollination, pollution and sediment regulation, maintenance of the hydrological cycle, erosion control, and climate regulation and carbon sequestration.

3) Abiotic factors, such as local climatic and chemical factors and the physical structure and functioning of ecosystems, which have a determining effect on agricultural biodiversity.

4) Socio-economic and cultural dimensions. Agricultural biodiversity is largely shaped and maintained by human activities and management practices, and a large number of people depend on agricultural biodiversity for sustainable livelihoods. These dimensions include traditional and local knowledge of agricultural biodiversity, cultural factors and participatory processes, as well as tourism associated with agricultural landscapes.

Convention on Biological Diversity

Why is it Important?

Biodiversity and agriculture are strongly interdependent

Biodiversity is the basis of agriculture. It has enabled farming systems to evolve ever since agriculture was first developed some 10,000 years ago. Biodiversity is the origin of all species of crops and domesticated livestock and the variety within them. It is also the foundation of ecosystem services essential to sustain agriculture and human well-being. Today's crop and livestock biodiversity are the result of many thousands years of human intervention.

Biodiversity and agriculture are strongly interrelated because while biodiversity is critical for agriculture, agriculture can also contribute to conservation and sustainable use of biodiversity. Indeed, sustainable agriculture both promotes and is enhanced by biodiversity. Maintenance of this biodiversity is essential for the sustainable production of food and other agricultural products and the benefits these provide to humanity, including food security, nutrition and livelihoods.

Importance of agricultural biodiversity

Biodiversity is essential to:

- ensure the production of food, fibre, fuel, fodder...
- maintain other ecosystem services
- allow adaptation to changing conditions - including climate change
- and sustain rural peoples' livelihoods

Agricultural biodiversity provides humans with food and raw materials for goods - such as cotton for clothing, wood for shelter and fuel, plants and roots for medicines, and materials for biofuels - and with incomes and livelihoods, including those derived from subsistence farming. Agricultural biodiversity also performs ecosystem services such as soil and water conservation, maintenance of soil fertility and biota, and pollination, all of which are essential to human survival. In addition, genetic diversity of agricultural biodiversity provides species with the ability to adapt to changing environment and evolve, by increasing their tolerance to frost, high temperature, drought and water-logging, as well as their resistance to particular diseases, pests and parasites for example. This is particularly important regarding climate change. The evolution of biodiversity, and therefore both its and our survival, mainly depends on this genetic diversity.

The importance of agricultural biodiversity encompasses socio-cultural, economic and environmental elements. All domesticated crops and animals result from human management of biodiversity, which is

From the CIP Genebank to the Farmers' Fields

Extensive screening of thousands of individual accessions of wild, native, and cultivated potatoes and of sweetpotatoes has helped scientists identify traits that help meet farmer needs and preferences, particularly in the face of climate change pressures. Examples of traits being explored for breeding include:

- Resistance to late blight disease and 10 different viruses, which are the most harmful potato diseases in the developing world
- Genetic resistance to the potato tuber moth and the Andean potato weevil
- Tolerance to frost, drought, heat, and soil salinity
- Higher iron content and bioavailability in potato
- Higher beta-carotene content in sweetpotato
- Disease, heat, and drought tolerance in sweetpotato
- Traits associated with cooking, taste, or processing preferences in both crops
- Higher yielding ahipa varieties adapted to agro-forestry-based and maize-mixed farming systems

A Living Collection: A Worldwide Resource

Available free upon request, material from CIP's potato, sweetpotato and ARTCs germplasm collection is used in breeding programs in over 100 countries around the world. The genebank promotes access and active use of its holdings:

- Clearly identifying, documenting and cataloguing species and landraces, and

Biodiversity (the variation of life forms within ecosystems) is nature's insurance policy. Genetic diversity is the way in which crops adapt to changing environments; a natural weapon offering them the flexibility to deal with unforeseen events such as climate change, and giving them greater chances to resist pests and diseases.

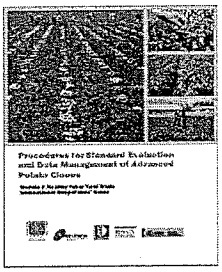
CIP works to study, protect, and utilize the diversity of potato, sweetpotato, and other Andean root and tuber crops (ARTCs) in sustainable agriculture systems, ensuring food security and increasing incomes for the rural communities where much of these resources are concentrated.

Genetic Diversity: Precious but Vulnerable

The inherited biological traits carried within the DNA of a crop's genes hold the key to survival. In potato, sweetpotato, and ARTCs it is easy to see genetic diversity in the fantastic variety of shapes, colors, and tastes that they show. But these genes also contain a hidden treasure, unseen characteristics like resistance to disease and drought, providing a valuable repository of traits that breeders and farmers can use.

Crop genetic diversity is under increasing pressure from urban development, disease, and climate change, while monocropping (agricultural practices focusing on a few high-yielding varieties) leaves food supply open to threat. Little to no genetic diversity makes crops susceptible to widespread disease, as happened during the Irish Potato Famine, when the late blight pathogen wiped out entire crops of the dominant potato variety, and one million people starved to death.

Publications



Procedures for Standard Evaluation and Data Management of Advanced Potato Clones

Sep 26, 2014 By: cip_admin

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