

POLICY BRIEF 05/2016 VERSION 2.3

Grow more potatoes for food security, nutrition and value creation in Vietnam

Executive statement

Potato globally is the third food crop after wheat and rice. Advantages of potato over rice and maize are the higher mineral and vitamin concentrations; it can be grown in winter and is more land and water efficient. Annual consumption in Viet Nam is about 5 kg per capita but in China almost 15 x more. Disadvantages are the degeneration of seed stocks, limited storability and susceptibility to a few diseases. Farmers attain about half of what they could economically attain if they had better seed, would apply fertilisers and irrigation water in accordance with crop needs and if they controlled diseases more efficiently. North Vietnam has ample land available in winter to grow more potato for food, processing and export.

This brief urges to start public-private initiatives to coordinate efforts and to invest in potato propagation material and in the development and deployment of decision support systems for growers to fine-tune supply and need of input of chemicals and irrigation water.

Introduction

Globally after wheat and rice, potato is the third food crop and rapidly gaining importance in (sub) tropical regions. Viet Nam annually produces around 440,000 t of potato on around 40,000 ha with a yield of 11 tons per hectare (FAOSTAT 2016). The main Growing areas are the Red River Delta (Bac Ninh, Thai Binh, Bac Giang and Nam Dinh) in the North and the Central Highlands (Lam Dong). In the North a winter crop is grown from mid-October till mid-January and a spring crop from early January till early March. The yields of the winter crop are around 12 t/ha, of the spring crop 9 t/ha and the main crop in the Central Highlands planted in December-January yields up to 20 t/ha. The potato as a vegetable has advantages over white rice as:

- it is richer in fibre, vitamins and minerals;
- it can be grown in the cool winter period when much land is left fallow and;
- is multiple times more efficient with water use than rice for the production of calories and protein for humans and can;
- be harvested over a long period where cereals need to ripen first so is less prone to weather hazards especially since the crop in the RRD is grown in winter.

Component (per 100g dry weight)	Maize	White rice	Wheat	Potato
Energy (kJ)	1696	1696	1574	1533
Protein (g)	10	8.11	14.5	9.5
Fibre (g)	8.1	1.48	14	10.5
Calcium (mg)	7.8	31.9	33.4	57.1
lron (mg)	3.01	0.91	3.66	3.71
Potassium (mg)	319	131	417	2004
Vitamin C (mg)	0	0	0	93.8

Source: USDA Food Composition Databases 2016

Potato production and consumption in Vietnam is very modest with less than 5 kg per person produced but not all consumed as part of the crop is used as seed for the next season. On the other hand Vietnamese also consume potato imported from China and as processed products from overseas. In e.g. India the winter crop extends to 2 million hectares and with a production of 40 million tons contributes considerably to the country's food security, in China even twice as much, whereas in the Netherlands 80 % of all potatoes are processed and exported: an example of an ultimate value chain and how the crop may contribute to the national economy.

Country	Area 1000 ha	Yield t/ha	Production Mt/y	Population million	Availability Kg/capita
Vietnam	40	11,0	0.440	93	4.7
India	1,990	22.8	45.0	1,300	35
China	5,770	15.4	89.4	1,400	68
Netherlands	156	45.2	7.05	17	415

Source: FAOSTAT 2016

Perspectives

The total potato production of Vietnam of 440,000 t/year at VND 10,000 per kg represent a farm gate value of VND 4.4 x 1012 (\leq 176 million) or a consumer (and seed user) value of close to VND 8 x 1012 (\leq 316 million). Potatoes are grown by 0.5 million families, input costs are 27 % of production costs so on average each family earns VND 6.4 million (\leq 256) per year by growing potato. Processors now buy 15,000 t raw material per year at VND 9,000 per kg representing a value of VND 135 billion (\leq 5.4 million) which produce 3,750 t of crisps selling at VND 154,000 per kg in the supermarket: VND 577.5 billion (\leq 23.1 million). Employing a simulation model with temperature, solar radiation,

rainfall, planting and harvest dates as input it was calculated that economically optimal yield levels that make best use of the resources labour, land, water, fertilizers and pesticides are around 20 t/ha in the Red River Delta (RRD) and 36 t/ha in the Central Highlands. Economically optimal yields are 70 % of the calculated potential in developed potato regions such as Japan, Europe and North America. Yields can almost double thereby positively influencing all resources, especially the profitability of the crop, thereby greatly improving resource use efficiency and making the produce suitable for processing and export. Doubling yields would more than double farmers' income from potatoes as the production price per kg is reduced as production takes place with greater efficiency.

Calculations and observations	RRD Winter	RRD spring	Central Highlands
Potential tuber yield (t/ha)	28.6	27.3	51.3
Actual tuber yield (t/ha)	12	9	20
Ratio Actual: Potential yield	0.42	0.33	0.39
Economically attainable yield (t/ha)	20.0	18.1	35.9
Irrigation need per season mm)	120	12	0



Doubling the yield of potato crops is easier than for cereals. Because the crop is multiplied vegetative, it's seed rapidly degenerates with each multiplication. Potato also is very sensitive to diseases particularly late blight and to dry soil conditions. These are reasons that current yields are low, but when dealt with properly these are also the reasons why considerable yield increases can be achieved with relatively modest investments. Potato, however, keeps having some drawbacks: it is bulky and watery, so hard to store and to transport.

Approach

A combination of the following practices should lead to doubling yields and strongly reduced costs of production to make the crop more affordable for consumers, for processors and competitive in export markets:

- The use of varieties that are well adapted to local weather and soil conditions and are resistant to prevailing pests and diseases. Currently the genetic base, in view of the wide variation of environments where the crop is grown, is narrow: just a handful.
- The use of healthy and well sprouted seed tubers of the proper size supplied with a health certificate. Currently much of the seed planted is degenerated due to accumulation of seed borne pests and diseases.
- Judicious use of fertilizers whereby the supply from the soil combined with the supply from fertilizers are in line with the demand of the crop.

- Crop protection against diseases and pests, especially late blight caused by Phytophthora infestans, currently causes much damage to the crop and its chemical control combined with varietal resistance should make control adequate.
- Irrigation scheduling according to the crop needs avoiding under irrigation and yield loss nor over-irrigation leading to leaching of nutrients and quality loss.
- Identification of additional suitable potato production environments where it is not too warm or too cold, the soils are not too heavy and where irrigation water is available.
- Introduction of machinery to till the land, plant the seed and harvest the crop.
- Market information and studies into storage of the ware crop to arrive at a more even distribution of potato throughout the year thereby reducing imports from China.

All these practices must be carried out jointly and concerted. It is of no use, for instance, to apply fertilizer properly when degenerated seed is used.

Recommendations, call for action

To assist in the realization of the practices mentioned above public-private potato initiatives need to start by the Ministry of Agriculture and Rural Development (MARD) institutes, centers and departments (of Crops, Plant Protection, Science and Technology, Institutes of Food Crops and Nutrition Science and Centers of Seed Testing), the Vietnam National University of Agriculture and the Vietnam Academy for Agricultural Sciences (VAAS) institutions, Vietnam National Agricultural Academy, international organizations (CIP, FAO), potato processors (Pepsico, Lilia, Orion), growers' organizations as well as countries interested in cooperation on potato such as the Kingdom of the Netherlands.

These potato initiatives need to result into a long term potato vision, a strategy and a coordinated action plan that constitutes of the following elements;

- A potato business plan entailing public-private investments and returns for the several actions to be taken.
- Studies on 1) agro-ecological zoning to explore more potential potato growing regions and seasons, 2) storage of ware potatoes to more regularly supply the market and 3) the setup of a nationwide market information system of table and seed potatoes to make markets more transparent.
- Introduction of a wide array of new varieties and advanced breeding material and the setup of a comprehensive breeding programme. This to widen the genetic base of potato in different environments for the fresh market and processing. Table and processing quality, resistance to pests and diseases, storability and sprouting characteristics receive much attention; registration should not include production trials and registration should not be limited to a particular region as the markets will prove most efficiently which variety merits existence.
- A government seed certification scheme based on the introduction of certified basic material from imports and/or from local public or private rapid multiplication programs and subsequently grown in dedicated seed program and downgraded with each multiplication.
- Develop and implement Decision Support Systems (DDS) to enable growers to better use resources, increase yields and lower costs by timing and dosing fertilizers, pesticides and irrigation water:
 - Fertiliser application requires soil analysis for granular composition, pH and mineral (N, P, K, Ca, Mg, Mn) content.
 - Chemicals against weeds, fungi, bacteria, nematodes and insects require their judicious use.
 Especially the control of late blight needs a DSS that makes use of past and future weather, growth stage and variety, timing, type of chemical and dose.



- The optimal use of irrigation water from sources (deep wells, surface, saline or not) applied through furrow, sprinkler, pivot or drip. Optimal use is assured by a DSS that takes soil properties, crop stage and past and future weather into account.
- Introduce and demonstrate potato machinery and equipment.
- The establishment of a public-private potato knowledge and material transfer system.
- Registration of potato sprouting inhibitors to extend the storage period of ware potatoes.
- Registration of more adequate crop protection chemicals to more effectively control diseases and pests.

Resource mobilization

Investments needed

The investments needed to realize potato's potential and achieve the goal of doubling yields and increased value creation require considerable mobilization and cooperation of national and international resources. Therefore after calculation of the return on investment:

An investment scheme is asked for:

- A national breeding programme
- Equipped labs for soil and plants and decision supports systems development
- Training growers in the use of decision support systems

An economic support program is asked for:

- The establishment of a national daily price information service
- Allowing land exchange schemes to reduce fragmentation and enable mechanization
- Innovative irrigation and drainage equipment and schemes
- Microcredit for growers to investment in land, machinery and inputs

Changed policies and regulations needed

- Registration of potato sprouting inhibitors
- Registration of a wider array of crop protection agents for potato
- Shortened potato variety registration system for commercial introduction of new potato varieties
 - Keep DUS/VCU testing
 - Dismiss production trials
 - Enable faster and cheaper introduction of new potato varieties to farmers
- Install an official seed certification scheme
 - Growers can rely on certified seed

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Colophon

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This policy brief was written as part of the project "Growing out of poverty with potato". "Growing out of Poverty with potato" is a project of Fresh Studio®, PepsiCo Foods Vietnam, Agrico B.V. and Applied Plant Research-WUR and the Ministry of Foreign Affairs of the Netherlands within the Facility for Sustainable Entrepreneurship and Food Security (FDOV).

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The objectives of this policy brief and the underlying research are to show how to realize the potential of the potato crop to assure food security, diversification of the diet and its role as a cash crop, to point out the current flaws in potato production and to show the perspectives of improving the system and the potential benefit from public and private partnerships.

