

More nutritious yellow potatoes in Colombia

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Acknowledgements and disclaimer

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The ideas in this report, including omissions and errors, are however solely the responsibility of the authors only and do not necessarily reflect those of the persons we met.

Abbreviations and glossary

\$	Colombian peso. In September 2017, \$2,900 = one US dollar
AICO	Autoridades Indígenas de Colombia Indigenous Authorities of Colombia
Asaiss	Asociación Agropecuaria Artesanal e Industrial El Socorro Artisan & Industrial Agriculture Association, El Socorro — and NER
Asogadan	Asociación de Ganaderos y Agricultores Amigos de la Naturaleza de Bogotá Association of Ranchers and Farmers, friend of nature, of Bogotá —an NER
Asopapa	Asociación de Cultivadores y Comercializadores de Papa de Sibaté Association of Growers and Marketers of Potato, Sibaté — and NER
CIFSRF	Canadian International Food Security Research Fund
Cooprolac:	Cooperativa de Productores de Lácteos, Alimentos y Concentrados Producer cooperative of dairy foods and concentrates —and NER
Corabastos	Corporación de Abastos de Bogotá SA Warehouse Corporation of Bogotá — main wholesale market
CORPOICA	Corporación Colombiana de Investigación Agropecuaria Colombian Agricultural Research Corporation,

ECAF	Escuelas comunitarias para la agricultura familiar Community schools for family farming
Eligessan	Escuelas de Formación de Líderes Gestores en Soberanía y SAN Training schools of leader and facilitators in food sovereignty and food and nutrition security
FNS/SAN	Food and nutrition security La seguridad alimentaria y nutricional
FEDEPAPA	Federación Colombiana de Productores de Papa Colombian Federation of Potato Growers
ICBF	Instituto Colombiano de Bienestar Familiar Colombian Institute for Family Welfare
IDRC	International Development Research Centre
MADR	Ministerio de Agricultura y Desarrollo Rural Ministry of Agriculture & Rural Development
MNP	Micro-nutrients in powder: packets with minerals and vitamins added to food for children
NER	núcleo empresarial rural rural business group
NGO	Non-governmental organisation
PMN	Papas Más Nutritivas, el proyecto More Nutritious Potatoes, the project
SAN	Seguridad Alimentaria y Nutrición Food and nutrition security
UMATA	Unidad Municipal de Asistencia Técnica Municipal technical assistance unit
UNC	Universidad Nacional de Colombia National University of Colombia

Executive Summary

This paper reviews one of the projects funded by the Canadian International Food Security Research Fund (CIFSRF), Phase 2, jointly funded by the International Development Research (IDRC) and Global Affairs Canada, **Scaling up the Production of More Nutritious Yellow Potatoes in Colombia (Papas Más Nutritivas, PMN**, in Spanish). It aims to capture the experiences of PMN and the lessons it provides, with particular interest in the contribution made by CIFSRF funding and the prospects for sustainability and scaling up.

PMN was funded from in July 2015 to end February 2018, following on from an earlier project funded in the first phase of CIFSRF ' **Improve potato production to increase food security for indigenous peoples of Colombia.**'

During that phase, a team from the National University of Colombia (UNC), in collaboration with colleagues from McGill University, worked in rural communities of the Department of Nariño in the south of the country to develop improved varieties of yellow potato. Three such varieties were created that have higher yields, contain more protein, iron and zinc, and are more resistant to late blight than the most common variety cultivated.

PMN aimed to scale up the production and consumption of the new varieties nationally, as well as to promote better food and nutrition security, above all in rural Nariño.

This review is based on reading of project documents and other background literature; interviews with IDRC staff and project leaders; and two weeks of field work in September 2017 in the project sites in Colombia that allowed discussion with project participants, local leaders, government staff and the field staff of the project.

At that time, the project still had five months to run, so that not all impacts would be readily apparent, even if intermediate results were.

The review was framed around constructing theories of change to represent the main causal chains of the project, from activities through intermediate results to impacts, then using the evidence gathered to test progress along those chains.

PMN had two main sets of activities. One concerned **multiplication and diffusion of the improved varieties of potato**. The project worked with four groups of smallholder growers who multiplied elite mini-tubers of the new varieties to basic seed, then to registered seed and finally to certified, quality seed for sale to growers — a cycle of multiplication that took 18 months. The aim was to establish the groups as commercial seed growers selling seed to potato farmers who would then produce the new varieties for consumers who would benefit from their enhanced nutrition content. The project has also promoted the new varieties among growers and consumers.

Direct interventions to improve food and nutrition security in rural Nariño made up the other main activities. The project worked with the Ministry of Health to distribute packets of micro-nutrients to be sprinkled on the food of young children, and so remedy deficits of vitamins and minerals, above all iron, vitamin A and zinc, in the diets of infants. It ran Community Schools for Family Farming (ECAF in Spanish) to promote more sustainable farming, home gardens, the recovery of local landraces, and traditional cooking. On completion of participation in the courses offered, participants were formed in home gardening groups to put into practice what they learned. In addition, schools for leaders in food security, sovereignty, and nutrition (Eligessan in Spanish) were run to prepare potential future leaders in all aspects of food and nutrition security.

Within these activities the project promoted **women's empowerment**. Not only did PMN work mainly with women farmers and mothers, but also the courses offered included training to raise awareness of gender relations among both men and women, to give women more confidence and voice, to allow them to take more decisions and realise their full capabilities.

In similar vein, PMN necessarily engaged in community development and reconstruction of the social fabric because it worked primarily in rural Nariño, in areas where until the peace accords of 2016, conflict was common. It also worked with communities of indigenous peoples who have been disadvantaged and looked down upon in the recent past.

The project also engaged with policy-makers, both at departmental, municipal and village levels in Nariño to **influence policy** for food and nutrition security, and nationally to promote the improved potato varieties.

Findings

For **potato seed dissemination**, the project team has worked effectively with producer groups to produce one cycle of certified seed and begin a second cycle. Group members have seen what it takes to produce quality seed, a long and demanding activity. Seed has been grown to high standards, but at relatively high costs that may be reduced with experience. Interestingly, the bulk of seed of the new varieties grown was, by early 2018, coming from individual commercial growers.

The various activities concerned directly with **food and nutrition security** have prospered. Mothers have used the sprinkles to supplement food for their young children. Formal tests of the efficacy of the sprinkles are still to be seen; but mothers believe they see improvements to the nutrition of their children.

ECAF and Eligessan schools have worked well: the participants have learned lessons and say that they apply them. Graduates of schools have formed groups of home gardeners, putting into practice most lessons learned, with results evident in greater production and consumption of fruit and vegetables, and the adoption of better hygiene, care of infants, and preparation of food. Some of the leaders trained have already engaged in planning for food and nutrition security at communal and municipal level.

Lessons on agro-ecology and the recuperation of traditional varieties and cultivation methods have been well received.

On **women's empowerment**, the project team has vigorously promoted gender awareness, taking advantage of the opportunities to do so. Women participants report that they have taken on board the messages; that they appreciated these orientations; and that they have seen some improvements in gender relations.

To **influence policy**, the project team has actively disseminated their methods and findings, forming good working relations with policy-makers from community to

national levels. The results to date from this are evident: the project has had a clear influence on thinking about food and nutrition security at departmental and municipal levels in Nariño. Leaders and staff in the departmental and municipal governments have accepted the approaches and findings of the project on food and nutrition security; in some cases to the point where project staff and participants have been involved in public planning.

Research partnerships and policy influence

Much capacity has been built among the researchers, both Canadian and Colombian, junior and senior. Canadians have benefited from the opportunity for field study, while the Colombians have valued the support and interchange with Canadian colleagues. Productive exchanges have gone beyond the boundaries of the project. Much of this can be attributed to the personal qualities, dedication and enthusiasm of the project leaders.

The project has made a considerable contribution to policy thinking, for a project of this scale. The impact on thinking about food and nutrition security in Nariño has been exceptional; with much acceptance of project approaches and findings at the local level.

The project has been able to work effectively in areas previously subject to conflict and to contribute to processes of reconstruction and reconciliation. It has also worked effectively in indigenous communities, where socio-economic disadvantages and a legacy of discrimination have been hindrances.

Sustainability and scaling up

For **potato seed multiplication** through producer groups, much depends on the ability of producer groups to create a profitable model for quality seed. That will entail economising on the processes and inputs used in the first cycle, while maintaining seed quality. While the project team will be able to support this, less certain is the creation of demand among ware potato growers for certified seed: quite what the scale of such demand may be, and will be in the near future, is hard to know — and the results of efforts to stimulate such demand are not easily predicted. That said, by early 2018 it was clear that individual commercial seed growers were taking up the new varieties to multiply and presumably had a market for the seed.

For the **micro-nutrients powders**, the programme is national and public: it will be sustained if the Ministry of Health believes it to be effective and has the resources to fund it. In the long run, as vulnerable Colombia households improve their diet, it should not be needed.

With regard to social and community action for **food and nutrition security**, so much depends on social processes within communities, in which leadership will be essential for the continuation of collective action. The importance of local social process and leadership applies even more strongly to sustaining progress towards **women's empowerment**.

That said, successful home gardens should be sustained: so long as households have plots of land and some time to devote to them. The news in early 2018 that the departmental government of Nariño intends to expand the schools across thirteen municipalities is welcome.

Beyond Nariño, it is more difficult to see how such models may be scaled out. The UNC team, however, plans to document the models and promote with the Ministry of agriculture and rural development, hoping that models may be adopted as part of national rural development policy.

Overview sheet

Theory of change	Multiply seed potato to spread new varieties	Improve FNS in Nariño through use of MNP, collective and social action in ECAF, Eligessan and home garden groups	Empower rural women	Influence policy
Activity	The team has worked vigorously to help groups produce quality seed.	Great amount and variety of activity with local communities to promote better food and nutrition security, through training in community schools, group formation, and promotion of use of micro-nutrient sprinkles. Messages go beyond food and nutrition to include sustainable farming, recuperation of indigenous knowledge and culture.	Gender issues addressed by inclusion in the curricula of the field schools; and by working in first instance with women farmers.	Project team has actively disseminated their methods and findings, forming good working relations with policy-makers from community to national levels.
Capacity and behaviour changes	Group members have learned how to produce quality seed	Mothers used the MNP to supplement food of their young children ECAF and Eligessan schools have worked well: the participants have learned lessons and say they apply them. Home garden groups functioning	Women participants report that they have taken on board the messages and that they have seen some improvements in gender relations.	Clear influence on thinking about food and nutrition security at departmental and municipal levels in Nariño
Results	By late 2017, the groups had completed only one cycle of seed, some at relatively high cost. Commercial multiplication going well.	Formal tests of efficacy of MNP still to be seen; but mothers believe they see improvements to nutrition of their children Graduates of schools have formed groups of home gardeners, putting into practice some of the lessons learned. Some have already exercised leadership in FNS planning at communal and municipal level	Hard to see precisely and clearly in the short term. Women interviewed believed that the results will be good.	Much acceptance of project ideas by departmental and municipal authorities; active collaboration in the planning of public action for FNS
Impacts	Good progress, reasons to expect impacts in future.	Good progress made, impacts only clear in medium term.	Impacts only clear in the medium to long run. Progress towards them has been made.	Significant effects in the municipalities and communities of Nariño, where the project works.
Sustainability and scaling				
Sustainability	Depends on the ability of groups to create a profitable model; also the demand for quality seed	For MNP, sustainability in hands of national and departmental governments For social and community action, much depends on social processes within communities. Leadership essential for the continuation of collective action	As part of community social action, women's empowerment depends on social processes in the communities: leadership essential for continuation of collective action	Depends on the sustainability of the project activities
Scaling up	A clear plan exists, but depends on	MNP are part of an already national programme.	See comments in cell to the left.	[Not applicable]

	resources that the UNC team can attract to support work in new departments.	<p>Departmental and municipal governments intend to adopt the community schools model and promote it.</p> <p>Beyond Nariño, not clear how the model would be scaled up. UNC, however, will look to promote the model with the ministry of agriculture and rural development, hoping that it may be taken as part of national rural development policy.</p>		
Specific results				
Food and nutrition security	By end 2017, little effect on the FNS yet apparent—but impacts will take time	<p>Increased production and consumption of fruit and vegetables; lessons in hygiene, care of young children—very likely to produce significant effects</p> <p>160 families (80% of households participating directly in the project) learned about eating and nutrition, and ancestral food. Survey reported increase from 18% to 53% in households with adequate diet diversity; perceived food security increased from 19% to 59% of households.</p>	Not applicable	
Income	3 of 4 seed grower groups (NER) have generated returns of 16% or more	<p>Cash income gains limited; although the home gardens produce valued fruit, vegetables and other items.</p> <p>64% of ECAF participants reported increased incomes</p> <p>One ECAF group has formed a credit union intended to raise incomes.</p>	Not applicable	
Sustainable agriculture	<p>Improved seed potato grown on 730 ha by Q2 2018: could reach 6M consumers</p> <p>Project works to recover local biodiversity: tries to reduce use of agro-chemicals, adopts organic methods</p>	<p>Schools teach ecological methods of production; as well as rediscovering the value biodiversity and older, more ecological practice. Good acceptance by the participants</p> <p>87% of ECAF participants reported reduced agrochemical use; 62% adapted soil protection practices, 50% followed safety measures when handling agro-chemicals; 54% established a garden at their home.</p> <p>74% of ECAF participants reported higher agricultural production</p>	Not applicable	
Gender	Not a focus of this component, although groups contain a majority	<p>The schools' lessons include gender awareness and relations. Most participants are rural women.</p> <p>Difficult to measure results, but participants valued the orientations.</p>		

	of women producers.			
Unexpected results		Good progress made in indigenous communities and territories in where reconciliation after conflict is taking place.		High degree of influence in municipal planning in Nariño.
Research partnership and policy influence				
Capacity building	A very fruitful scientific collaboration for both Colombian and Canadian parties. Committed and talented project leadership.			
Contribution to policy and general thinking	The project is known in Bogotá: good relations with policy-makers. Although so far it has not necessarily succeeded in changing national policies.	FNS activities have been very well received by departmental and municipal governments: collaboration to the point of training municipal level staff.	Gender policy not a focus.	In Nariño, a notable contribution to the discussions and activities. Active engagement in local planning; departmental ministry reprinting guides on cooking and diet; department to replicate Eligessan schools in 13 municipalities Good contribution at the national level, for a project of this magnitude.

Key colors:

Highly unsatisfactory	Unsatisfactory	Moderately satisfactory	Satisfactory	Highly satisfactory
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1 Introduction

1.1 Purpose of report and aims of study

1.1.1 Introducing CIFSRF

The Canadian International Food Security Research Fund (CIFSRF) was designed to address global problems of food and nutritional insecurity through applied, collaborative, results-oriented research. CIFSRF is a program of Canada's International Development Research Centre (IDRC) undertaken with the financial support of the Government of Canada, provided through Global Affairs Canada (GAC). Phase 1 (2009-2014) focused on testing innovations, while Phase 2 (2013-2018) aims to both test scaling up methods/mechanisms and to scale up practical solutions to: increase food production, raise income for farming families, and improve nutrition. The emphasis in Phase 2 was to harness the best of the private, public and not-for-profit sectors to expand CIFSRF's research portfolio so innovations reach more people and have a greater impact globally to improve food security.

CIFSRF set the parameters of the Phase 2 research projects by requesting certain similar elements, such as a need to have: a team of diverse partners (including at least one private sector or business partner, at least one Canadian partner and at least one developing country partner) to scale up pilot-tested agricultural innovations; a scaling up plan; a business model with a proof of concept and value proposition; a gender strategy; rigorous research plan and methodology to test the scaling up; policy uptake plan; as well as a comprehensive exit strategy. All projects needed to address the three cross-cutting themes of the program: gender equality, environmental sustainability, and good governance. While the projects were autonomous, the strategic calls allowed for a level of consistency across the projects

While 18 projects were funded as independent projects in CIFSRF Phase 2 through competitive calls, the projects received significant group training and capacity building from IDRC over their duration, including specific workshops and mentoring on: scaling up, research methodology, gender integration, communications, and monitoring and evaluation. IDRC Program Officers

provided specific support on the development and implementation of these strategies, through workshops and direct technical advice. The group workshops facilitated by IDRC also allowed opportunities for cross-project collaboration and the sharing of lessons.

1.1.2 This study

The Overseas Development Institute was commissioned to carry out a contribution analysis of the second phase of CIFSRF, primarily to generate learning about the programme for the benefit of IDRC.

As part of this work, six research projects funded under CIFSRF Phase Two were selected for more detailed study in the field. One of those was **Scaling up the Production of More Nutritious Yellow Potatoes in Colombia**, usually shortened in Colombia to **Papas Más Nutritivas (PMN)** — More Nutritious Potatoes.

The study aimed to assess the emerging results and impacts of PMN, to generate lessons from the experience. In more detail, the objectives were to:

- Examine the evidence of adoption of innovations developed and promoted by PMN;
- Assess the results of adoption and impacts upon incomes, food and nutrition security, and agricultural productivity in sustainable farming systems of target farmers and consumers;
- Look for evidence of impacts on other farmers and households;
- Assess the contribution of the CIFSRF project to the changes seen; and, to
- Consider the sustainability of the changes seen and the potential for scaling up, including the conditions that might promote such diffusion.

1.2 Introducing the project: More Nutritious Potatoes

PMN, started in July 2015, is based on a previous project funded in the first phase of CIFSRF ' **Improve potato production to increase food security for indigenous peoples of Colombia** ', known by its short Spanish title of ' **SAN Nariño** '.

During this previous phase a team from the National University of Colombia (UNC), in collaboration with colleagues from Canada, worked in rural communities of Nariño on issues of food and nutrition security (FNS). The teams studied food and nutrition security in rural areas of Nariño, the role of women in rural households, and ancestral gastronomy. They focused their efforts on developing more nutritious yellow potatoes that were widely grown and consumed in the area. With the participation of local farmers, potato varieties were selected from among the wide range of native potato varieties; their genetic make up and nutrition characteristics were examined in the laboratory; and the results then used to develop three improved varieties of yellow potato. These have more resistance to blight [*Phytophthora infestans*]; yield more; and contain more protein, iron and zinc (details in Box 2A, section 2.2.1.) than the most commonly planted current variety. *Criolla Colombia*.

1.2.1 Aims of PMN

The overall objective of PMN is:

'To scale up the adoption of improved potato varieties with high nutritional qualities for Colombian consumers and potato producers in an operational strategy that links agriculture to nutrition for alleviating food insecurity and undernutrition.' [Project Approval Document, October 2015]

More specifically, the project aims:

To enhance the adoption of three new potato varieties with enhanced nutritional quality (Criolla Sua Pa, Criolla Ocarina and Criolla Dorada).

To implement and test a scaling up model for the adoption of improved potato varieties with high nutritional qualities across Colombia.

To involve national, regional, and local institutions in the model implementation, evaluation, and appropriation.

To build a long-term, competent and professional leadership through the multidisciplinary Food Security and Nutrition graduate program at the National University of Colombia by combining agriculture and nutrition practices.

[Project Approval Document, October 2015]

1.2.2 Activities

Two main sets of activities make up PMN. One is the **multiplication, distribution, and production of improved varieties of potato**. The project works with groups of smallholders, who multiply seed from elite mini-tubers through to quality, certified seed to sell to those growing potatoes for consumption. In addition, PMN has advertised and otherwise promoted the new and improved varieties of potato.

The other set promotes food and nutrition security, within broader social development activities in the Nariño countryside. The project has helped implement a nationwide programme to supply micro-nutrient powders (MNP — 'sprinkles') to mothers. These sprinkles can be added to small children's food once every two days, giving the child most of the micro-nutrients needed.

The PMN team also formed Community Schools for Family Farming (ECAF), made up of 20 to 40 farmers from a locality, often with a majority of women farmers. The ECAF have a broader mandate than that of most rural agricultural schools. Instead of limiting their work to improving technology and agricultural practices, courses have covered most of the dimensions of food and nutrition security: growing fruits and vegetables, preparing food, hygiene, feeding practices, and guidance on gender issues.

Once they graduated from the schools, members were encouraged to form local community groups called *Shagras para la vida* (Home gardens for life). The groups cultivate a communal garden and encourage members to create their own family gardens. These groups not only grow fruits and vegetables, but some also produce trees and plants to be planted in the upper reaches of river basins above their communities, to conserve soil, promote infiltration and ensure that streams run throughout the year.

In addition, the PMN team have run leadership schools (Schools for Leaders and Facilitators of Food Security, Sovereignty and Nutrition - Eligessan) for food and nutrition security, again organised for groups at community level. These cover a curriculum similar to the ECAF, but emphasise food sovereignty: local production for local needs, organic and agro-ecological production,

conservation of local agro-biodiversity and recovery of local knowledge of native varieties and ancestral cooking. The schools aim to train community leaders who not only promote local production and consumption of healthy foods, but also can influence policy and practice in their communities and municipalities.

1.2.3 Context: the Nariño countryside

The project has operated in two areas of Colombia: in two municipalities in the peripheries of Bogotá; and, above all, in five municipalities of Nariño, a department of the south-west of the country (Figure 1.1).

Figure 1.1 Map of the municipalities of Nariño where the project operates



Source: The PMN project

The areas of Nariño in which the project has operated are rural, where agriculture predominates in the economy. Farmers grow cereals, potatoes, vegetables; and raise dairy cows, chickens and guinea pigs. Most rural households have access to only small areas of land: few till more than five hectares, owing to an uneven distribution of agricultural land, relatively dense rural settlement, in Andean highlands where part of the land is not cultivated because it is too steep or because it is a legally protected area of high moorland (páramo). Many rural households

have to rent land in to supplement their meagre personal holdings. Consequently, owing to lack of land, some farmers have entered the páramos to cultivate, graze, and cut firewood: areas that should be conserved, for their nature and by their ecological functions, including the regulation of watercourses.

The majority of the rural population in the Andean areas of Nariño live on limited incomes. This is one reason why a study of food and nutrition security carried out at the end

of 2013 by the SAN Nariño project in the five municipalities where it worked, revealed a high prevalence of chronic malnutrition in rural communities where it operated (Figure 1.2). On average, 35% of young children under the age of five were stunted. This can be compared with a prevalence of 13% nationally, and 17% in Nariño, as registered by the 2010 National Survey of the Nutritional Situation in Colombia (ENSIN 2010).

In addition, several of the communities where the project works are identified as indigenous and disadvantaged. In some cases, they have also seen conflicts in recent times.

Figure 1.2 Prevalence of chronic malnutrition in children, five municipalities in Nariño, 2013

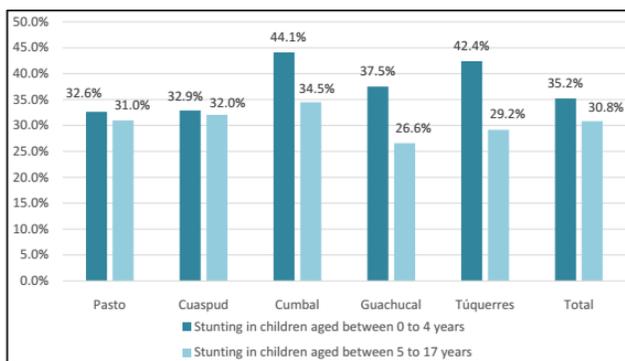


Figure 2. Stunting prevalence for children aged 0 - 4 years and 5 - 17 years of the Nariño Department. 16.9% of children aged 0 - 4 years of Nariño Department have stunting or low height for age according to the ENSIN 2010. 14.1% of children aged 5-17 years of Nariño Department have stunting or low height for age according to the ENSIN 2010.

Source: M. Castillo and others, 2014

Note: Chronic malnutrition is defined by the relationship of size at the age of the child: which measured two deviations below the median standards is considered to suffer from chronic malnutrition.

1.3 Methods

The study was conducted by Ricardo Vargas Meza, a sociologist and consultant based in Colombia, and Steve Wiggins, an agricultural economist at ODI. The work in Colombia began on September 11 and ended on September 22, see itinerary in Annex A.

Having little more than two weeks to collect data, and four days at project field sites, the method focused on obtaining as much relevant information as possible during that time. Nevertheless, the team were able to visit most of the communities where PMN had worked. Selection of groups within those communities was largely governed by availability of participants at the time of visit. Any attempt

to make the selection more random, would have taken time that the team did not have; and led to a smaller sample of participants. That drawback had to be traded off against the need to gain as much insight as possible into what the project had done, to what effect, and how this was seen by participants: in effect, opting for greater exposure to experiences of different participants, even if they were not randomly selected.

The study is based on information collected from the following sources:

- Project documentation, including the project approval document and technical reports;
- Interviews with the project team in Bogotá and Nariño;
- Visits to the Nariño field to interview the project participants, individually or in groups; and,
- Interviews with government officials at the national, regional and municipal levels.

The methods used were mostly qualitative: at the time of the study many results had not been measured. This is largely because the study was carried out before the end of the PMN project activities, scheduled for the end of February 2018; and before the formal evaluation of the project that to be carried out between October and December 2017. This has been mitigated by use of results documented in the final technical report of April 2018.

A further small limitation of this study is that it was not possible to follow all the activities that the project had carried out, since PMN stands out for the very wide range of its activity. Therefore, elements such as the promotion of improved potatoes with consumers, and the use of powdered micro-nutrients, were not investigated to the same degree as the other activities.

The rest of the report consists of the following. Chapter two describes the PMN project and presents an interpretation of its logic in the form of theories of change. The third chapter presents the observed and expected results and impacts of the different components of the project. The last chapter contains a summary of the results of the PMN, the prospects for sustaining and

scaling up project activities, and the contribution of the CIFSRF funding to what has been achieved.

2. The project

2.1 Project theories of change

The PMN project consists of several related activities that can appear quite complex. The vision of the PMN team of PMN (Figure 2.1) reveals a holistic conception of the project.

The project can also and more precisely, however, be presented as a set of theories of change (Figure 2.2) that trace the causal chain of the project from its activities, to their immediate results in changing the capabilities of the

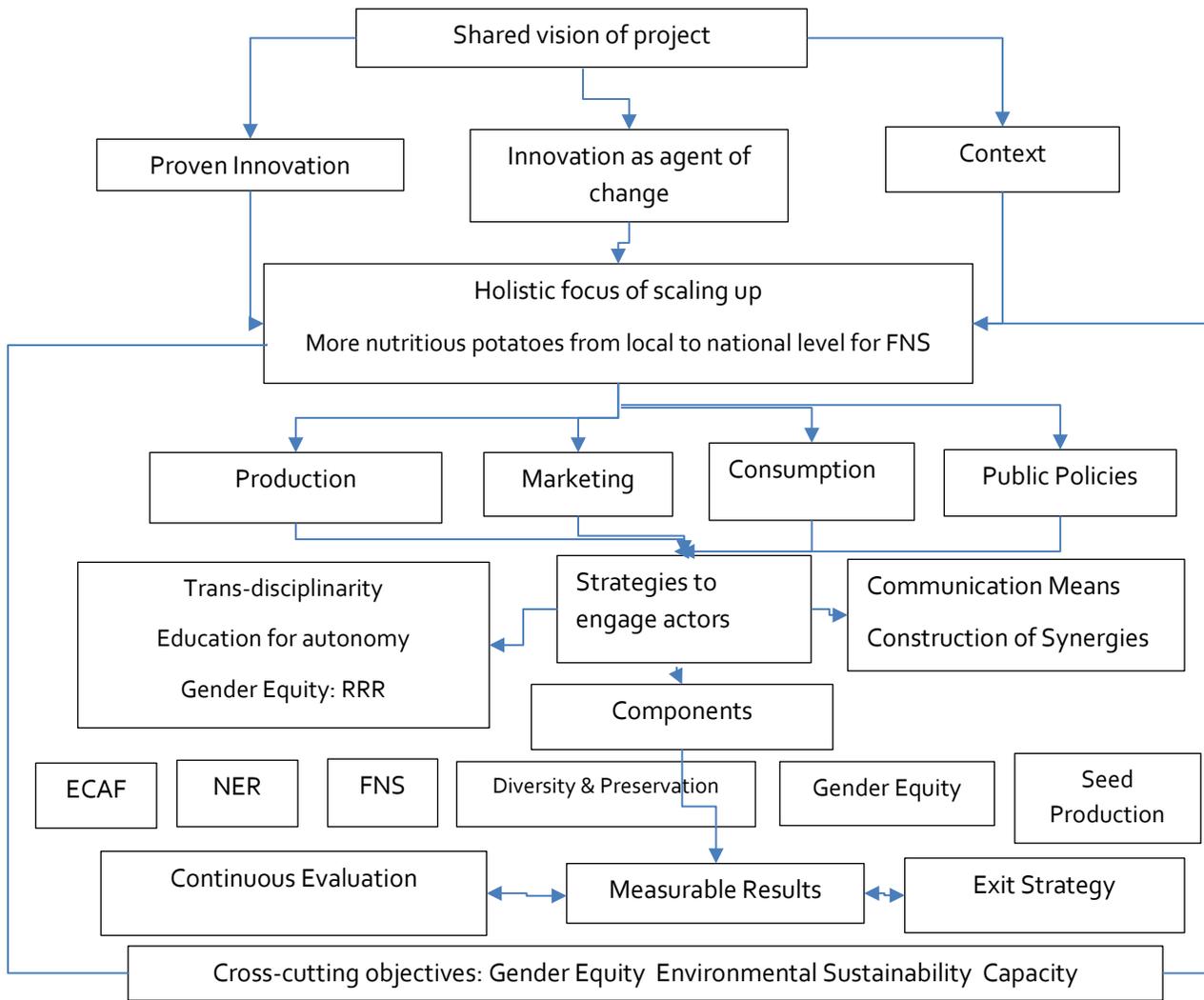
participants ('beneficiaries', 'clients'), to changes in their behaviour, the results of such changes, and, finally, to their impact at the highest level.¹

The theories of change are based on assumptions about conditions and potential risks outside the control of the project (right-hand column Figure 2.2); complemented by the contributory actions of other agencies not formally part of the project (left-hand column, Figure 2.2).

Because PMN is a project of multiple components, four theories have been constructed for the different components: diffusion of potato varieties; promotion of FNS; empowerment of women; and influencing public policy

¹ This reflects the ideas set out in Mayne & Johnson (2015), Mayne (2016).

Figure 2.1 PMN team vision of the project



Source: PMN project team, translated

Figure 2.2 Theories of change of PMN

a) Potatoes: seed production, cultivation and commercialisation

Enabling elements	Central narrative	Assumptions to reach the states on the left
Public health services, investments in drinking water, lead to better health, especially for young children, and, hence allow full realisation of health benefits	<p>Impacts on farmers and consumers</p> <p>Farmers get higher and more reliable yields: they earn more from their potato harvests</p> <p>Consumers consume improved potato varieties, and thus receive more protein, Zn and Fe. Nutrition is improved, especially that of children</p>	There are no dietary changes that reduce their nutritional value, as, for example, by consuming more processed foods (eg pasta).
<p>The ICBF's <i>De Cero a Siempre</i> programme buys improved potatoes</p> <p>The program of the Min., Education National School Feeding Program (PAE) buys improved potatoes</p>	<p>Results</p> <p>Farmers produce improved potatoes: consume at home, sell to the market</p> <p>Consumers buy improved potato.</p> <p>Children have access to better nutrition through government programmes that provide food that includes improved potatoes.</p>	<p>Potato and potato seed production generates attractive margins for farmers: prices of potatoes do not fall</p> <p>The potato market can absorb additional production without falling prices</p> <p>Central, departmental and municipal government feeding policies include improved potatoes in school supplies.</p>
	<p>Practice changes</p> <p>Members of NER grow potato seed, sell to potato producers</p> <p>Reaction: some farmers become specialised producers of potato seed;</p> <p>Most potato growers switch to improved varieties</p>	<p>Potato crops are not unduly affected by bad weather, pests and diseases</p> <p>[Improved varieties are more resistant to blight.]</p> <p>Consumers learn about improved potatoes and their characteristics.</p>
	<p>Capacity changes:</p> <p>C: NER members understand how to grow potato seed</p> <p>C: farmers in general learn more about potatoes, can evaluate varieties</p> <p>O: To sell potato seed</p> <p>O: Sell improved potato varieties</p> <p>M: Higher income, pride in recognising varieties</p> <p>Reach: members of NER and other potato producers in 4 locations in Nariño, 2 in Bogotá / Cundinamarca</p>	[Few assumptions here: if the program works as planned, then these changes should take place]
<p>Cooperation with:</p> <ul style="list-style-type: none"> • Minag, Corpoica • Local and provincial government • Indigenous Authorities of Colombia (AICO): distribution of seeds 	<p>Activity</p> <p>Technical support to groups of farmers (NER) in growing potato seed</p> <p>Educate, through the farmers' schools (ECAF), the evaluation of potato varieties, and the production techniques</p> <p>Hold ECAF fairs</p>	

C = competition, O = opportunity, M = motivation

(b) Food and nutrition security

Enabling elements	Central narrative	Assumptions to reach the states on the left
Public health programs and the provision of safe drinking water and sanitation provide a healthy environment for growing children	<p>Impacts</p> <p>The nutrition of children increases due to a lower (zero) incidence of micro-nutrient deficits: their physical and mental development is good</p> <p>Nutrition of the whole family improves, allowing the family to realise its potential</p>	
	<p>Results</p> <p>Young children receive enough micro-nutrients for normal development</p> <p>Participating families eat a more diverse diet, richer in vitamins and minerals.</p>	No changes in the diets of children, or family, that could reduce nutrient content, such as switching to convenience foods with fewer nutrients
Provision of micro-nutrient powders to mothers, by the Ministry of Health	<p>Changes in practice</p> <p>Mothers add MNPs to small children's meals</p> <p>Production of more fruit and vegetables in gardens</p> <p>Greater consumption of fruit and vegetables in the family diet</p> <p>Reaction: children consume more nutrients in deficits, especially Fe, Zn [Ca]</p>	Mothers convinced of the effectiveness of MNPs: disciplined to use them regularly [once every two days]
	<p>Capacity changes:</p> <p>C: Mothers know more about their children's nutrition</p> <p>C: Leaders know more about nutrition, [biodiversity, history, culture]</p> <p>O: Provision of supplements: MNPs</p> <p>M: Better care and development of children</p> <p>Reach:</p> <p>Groups of mothers in 4 communities, Nariño</p> <p>Potential leaders in rural communities of Nariño</p>	
ICBF trains mothers <i>Min Health: Estrategia Integral de Fortificación con Polvo de Micronutrientes (MNP) y Programa Nacional de Reducción y prevención de la anemia</i> in the Department of Nariño Provincial and municipal health workers	<p>Activity</p> <p>Train mothers in nutrition</p> <p>Distribute micro-nutrient powder packages (MNP) to mothers</p> <p>Train potential leaders in SAN and food systems (Eligessan schools), topics to include family gardens, traditional medicine, traditional gastronomy, etc.</p>	

(c) Women's empowerment

Enabling elements	Central narrative	Assumptions to reach the states on the left
	<p>Impacts</p> <p>Rural women have more confidence, self-esteem, and improve their participation in household decision-making and in institutional forums.</p>	
	<p>Results</p> <p>Women have more pride in their abilities and roles</p> <p>Recognition of the role of rural women, work redistributed, active participation and decision-making in public forums</p>	<p>Leaders, of either sex, encourage women to participate in public forums, to take up leadership</p>
	<p>Behaviour changes</p> <p>Women more aware of their own value</p> <p>Men give more respect to their wives, daughters: ending, or at least significantly reducing, violence, abuse, demeaning attitudes</p> <p>Men assume a fair share of domestic work</p> <p>Reaction: [difficult goals to establish for such changes: any significant change would be progress]</p>	<p>Men prepared to take on more work, especially at home</p>
	<p>Capacity changes:</p> <p>C: Rural men and women become more aware of gender disparities</p> <p>O: Training in agriculture, FNS offers spaces for discussion</p> <p>M: Appreciation of the value of human beings</p> <p>Reach: Families in 4 communities, rural Nariño</p>	<p>Men willing to abandon sexist roles; or at least, that they do not oppose new models of masculinity</p>
<p>The ICBF includes gender awareness in its training</p> <p>Fucom: gender awareness training</p>	<p>Involve rural women in farmer field schools (ECAAF), in leadership training (Eligessan)</p> <p>Include women's roles and workloads in the agenda of field schools, leadership training</p> <p>Work with local leaders to raise awareness</p>	

(d) Policy influence

Enabling elements	Central narrative	Assumptions to reach the states on the left
	Impacts Priority of nutrition raised in Colombia More effective public programmes to improve nutrition	Policy-making receptive to new evidence
	Results Public agencies improve their nutrition programmes: they assign more resources MinAg includes nutrition as a criterion to evaluate new varieties	
	Behaviour changes Policy-makers assign more priority to nutrition The general public places greater emphasis on better nutrition	Programme reports are sufficiently convincing to change ideas and perceptions of readers
Policy-makers and opinion makers are accessible, participate in meetings and are prepared to discuss issues	Capacity changes C: Colombian policy-makers, opinion makers, aware of the programme and the problems it addresses C: Masters students trained in FNS O: Results of the main programme showing the effectiveness of the improved potato M: Better informed public policy, pride in solving problems Reach: managers in ICBF, Min Ag, Min Salud, other agencies, general public	
	Disseminate programme findings Meet frequently with the staff of ICBF, MinAg, etc. to analyse nutrition and how to improve it Establish a master's course in FNS to the UNC	

2.2 Testing the theory of change

This section traces the theory of change, from activities to impacts, against the evidence gathered; for each of the four causal chains.

2.2.1 The diffusion of improved potato varieties

Activities carried out

After having created three varieties of potato yellow based on the participatory selection of original varieties in the precursor project (Box 2A), the centrepiece of PMN is

to promote the production and consumption of these varieties.

For **supply of potatoes**, the approach has been to work with groups of rural entrepreneurs (NER), groups that work together to produce potato seed of good quality. Then the seed is sold to producers of potato for consumption.

PMN has worked with four NER: two in the area of Bogotá and Cundinamarca, and two in Nariño. The project has provided the groups with extensive technical assistance during more than one cycle of quality seed production.

Box 2A Improved varieties of potato

The three improved varieties of yellow potato have advantages over the currently more common variety, the *Criolla Colombia*, in yield per hectare, resistance to blight, and content of protein, iron and zinc.

All three outperform the *Criolla Colombia* in all these dimensions, based on the evidence of the project.

	Yield per hectare	Late blight resistance (out of 10)	Protein content per 100 g	Iron per kg	Zinc per kg
Criolla Colombia (commercial)	32.4 t/ha	2.8 (out of 10)	4 g/100 g	18.2 mg/kg	12.6 mg/kg
Criolla Dorada	37.1 t/ha	6.3 (out of 10)	9.7 g/100 g	21.7 mg/kg	14.7 mg/kg
Criolla Ocarina	34.5 t/ha	3 (out of 10)	5.1 g/100 g	18.7 mg/kg	14 mg/kg
Criolla Sua Pa	37.4 t/ha	4.4 (out of 10)	9.2 g/100 g	20.3 mg/kg	14.7 mg/kg

Source: PMN project

Quality seed production is a long and demanding process. The steps are as follows:

- Production of **elite seed, in mini-tubers**, by a specialised company that has laboratories and greenhouses to produce true seed;
- The NER sow the mini-tubers to produce **basic seed**, with an expected multiplication rate of 10;
- Basic seed potatoes are then multiplied to produce **registered seed**, with an expected 12 times multiplication rate; and,

- Finally, the registered seed is further multiplied, by a factor of 14 to produce **certified seed**.

Each seed multiplication takes six months until the harvest, so that the complete cycle of producing seed certified for sale lasts 18 months in total. At each step the original seed is multiplied, so the mini-tubers eventually become 1,680 times more as certified seed for sale. At the same time, the necessary planting area increases with each step: if the elite seed is planted on a quarter of a

hectare, after two more cycles, nearly 30 ha is needed to grow the registered seed.

The demands of producing potato seed are significant. Great care is required to protect the potatoes from pests and disease: which is why the seeds are usually cultivated at altitude, in relatively cold areas where pests are less common. In addition, potato plants that have not developed in accordance with the genotype must be removed ('rogued'): a laborious process. Producing seed potato requires dedication, labour and expertise.

Although the implementation of the project was not the object of this study, from what was seen in the field visits, the technical teams from UNC worked well with the groups. They follow closely their progress through the cycles. They maintain detailed records of planting, inputs and costs, and harvests. Above all, they combine enthusiasm for the tasks with considerable technical expertise.

On **the demand for the improved potato varieties**, the UNC team has used various media to promote them. Among others, the measures taken include the following:

- The UNC News Agency has published the results of the studies in the media: for example, in the newspaper *El Tiempo*, *Radio Caracol*;
- Also through the same agency, announcements about new varieties have been made in *Corabastos*, the wholesale market of food in Bogotá;
- The Ministry of Agriculture conducts a national campaign to promote potato consumption, with *Fedepapa*, the federation of potato producers. The campaign includes the new varieties;
- The UNC has mounted a stand, next to that of *Fedepapa*, in the national exhibition of agriculture, *AgroExpo*, in Bogotá; and
- Messages have been issued through Facebook (<https://goo.gl/nxzbu7>) and Twitter (<https://goo.gl/fs7Hw8>).

In addition, the project has taken advantage of the opportunity presented by another UNC project. In collaboration with the Ministry of Health, nutritional information has been offered to students and parents from schools in Sopo and Sibaté in Cundinamarca

Department. The project promotes school shops stocked with healthy food, and they ask parents to prepare their children's lunches with healthy options. Among the messages have been those about the enhanced potatoes.

Given the limited resources of time and budget that the team of PMN has had to stimulate demand for improved varieties of potato, the scale and amount of activity seems admirable.

Capacity and behaviour changes

After visiting three of the four NER, interviews with group members showed that they had learned how to produce quality seed. Most were enthusiastic about this new activity, despite the significant challenge of mastering the skills required. However, significant differences could be seen in formal education and resources among the members: some had captured more of the basics of producing seed than others.

Results

As at September 2017, the four NER had produced almost 160 tonnes of seed, plus 112 tonnes of potatoes for sale — these being crops to ensure a return to the NER as they wait to complete their cycle of seed multiplication. (Table 2.1).

Table 2.1 Potato production by the groups

NER	Members	Seed sale (tonne)	Commercial sale (tonne)
ASOGADAN	18	127.9	99.2
ASOPAPA, Sibaté	50	7.5	1.65
Total, Bogotá and Cundinamarca	68	135.4	100.9
COOPROLAC, Túquerres	32	19.9	8.0
ASSAIS, El Socorro	33	4.45	3.45
Total, Nariño	65	24.35	11.5
Total general	133	159.8	112.3

Source: Reports of PMN

Given the cycle of 18 months from sowing mini-tubers and harvesting certified seed, the groups were just beginning the second cycle. Therefore, the members had not yet gained that much experience yet of the practices and techniques required.

Of the four groups, by early 2018 it was clear that three were earning good returns; but one was not. In this case, a review of the information recorded by the UNC team revealed an apparent financial loss in seed production. Although given that labour was a major cost, and this came from members, calculations showed an implicit return to the workforce of about \$12,000, about US\$4 per day. If they did not have to lease the land, this would have been \$18,000, or US\$ 6 per day. This compares with salaries of between \$15,000 and \$20,000 paid daily for day labourers in the rural zone of Nariño.

Hence a challenge for this NER is lowering production costs so that seed growing is profitable, offering a return to the members' time above typical wages in the area.

With regard to the results of the various measures to stimulate the demand for improved potatoes, the exact results seem not be known: it appears the project does not collect data on this. Given, however, the limited scale of commercial production of the new potatoes, only a small share of all yellow potato consumed will have been from the new varieties.

In parallel with the groups of smallholders multiplying seed from the new varieties, the company producing the mini-tubers was also selling these commercially to individual seed growers. Based on the likely yield seed to be harvested from the mini-tubers, it seems that production by these latter growers has exceeded that by the groups by at least four times.²

At the end of 2017, it was clear that seed production was flourishing, even if the great bulk was not coming from the groups on which PMN has focused. By early 2018, enough seed was being produced to plant up 16% of the national area of yellow potatoes with the new varieties. While less, than the ambitious target of 50% set, this

shows that the new varieties have established themselves as rivals to existing ones.

Impacts

Impacts on consumption of the new varieties of yellow potatoes can only be surmised. The PMN team estimated, based on seed production and the likely harvest that would result, that by early 2018 more than six million consumers would have consumed the new varieties.

Final impacts on nutrition from the enhanced qualities of the new varieties remain to be seen: it will take a year or two more before these effects will be measurable.

2.2.2 Food and nutrition security

Activities carried out

Almost all the direct activities to improve food and nutrition security (FNS) have taken place in Nariño. Among them is the dissemination of micro-nutrient powders (MNP); teaching of producers and consumers in the community schools (ECAF) and the leaders' schools (Eligessan) in FNS matters; and the promotion of collective home gardens ('shagras') to produce food high rich in vitamins and minerals.

Fortification of infant food through micro-nutrient powders

The use of micro-nutrient powders (MNP) is a Ministry of Health programme, in response to the high incidence of deficiencies in minerals and vitamins in the diet in rural areas of Nariño. These deficits threaten the mental and physical development of young children, as well as leading to disease, disability or premature death.

The project has collaborated with the Ministry in the delivery of the packets to health posts in the municipalities of Guachucal and Carlosama-Cuaspu; as well as direct delivery to mothers participating in the project in Túquerres and Cumbal and to participants in the community schools (ECAF). Home visits have been made to follow-up on the use of MNP packets.

Project nutritionists have also advised the field staff of the Ministry in the use of the powders; as not all the staff had

growers. Earlier reports show a 4 to 1 ratio of individual to group production.

² Precise data on sales of mini-tubers are not to be found in the final report, but a graph gives an indication of the relative magnitudes of seed production by groups and by individual

experience and training in this area. The degree of collaboration and trust that the project has achieved with the Ministry in its operations in Nariño is considerable.

Home gardens and nutrition education

The project has promoted production of fruit, vegetables and other nutritious food in home gardens; accompanied by education on the quality of food and good diets. In more detail, the project teams have promoted:

- **Gardens of fruit and vegetables** individually and in groups. Techniques stress environmentally sustainable practices that draw on ecological processes. The project team has also promoted the recuperation of traditional knowledge of crop landraces, their uses and their cultivation;
- **Native seed banks** at each of the community development centres, aiming to recover and conserve of seeds and plants native to the local areas;
- **Exchange network** among gardeners to foster exchange of seeds and knowledge;
- **Ancestral gastronomy**: holding traditional cooking workshops that promote longstanding recipes, using local foods, that have tended to be lost in favour of processed food, and forming networks across the department; and,
- Promotion of **community development and strengthening of local culture** — within a context of rural areas that until 2016 had seen open conflict, leading suspicion and distrust within communities.

These activities have reached 160 families where nutrition has been monitored and technical assistance offered on home gardens; as well as groups in 40 villages and hamlets ('veredas').

Capacity and behaviour changes

For the **fortification of the diet with MNP**, mothers participating in the ECAF were indeed administering the powders. The children ate the food thus fortified, although they reported that the powders tended to give food a taste of medicine.

As for the **home gardens and nutrition education**, participants had taken on board many of the messages, were learning to improve their diets, and were learning by doing in the gardens. Indeed, it was notable how passionate some of the participants interviewed were

about recovering indigenous knowledge and practising a more organic agriculture.

Results

With respect to the **fortification of the diet**, mothers pointed out that they saw a difference in the health of their children: less pale in complexion, less incidence of colds and 'flu.

For the **home gardens** extra production of fruit and vegetables was evident. In addition, some groups were raising tree seedlings and other plants to reforest the watershed in the moorlands in the upper reaches of watersheds.

Impacts

The project is evaluating the effect of the use of the MNP formally, by taking blood samples from a sample of young children. The results of this formal evaluation were not known by late 2017.

Among the participants in home gardens and nutrition education, survey results from late 2017 showed that diet diversity scores had improved: before the project only 18% of participating households had an adequately diverse diet, by late 2017 53% did. Food security had also improved, with those perceiving their households to be food secure rising from 19% to 53% of participants.

Some impacts are intangible: the reconstruction of the social fabric and the recovery of biodiversity and with it, recuperation of ancestral culture. This has not been measured, but the interviews showed how much some participants valued this.

2.2.3 Women's empowerment

Activities carried out

The project has included gender perspectives on productive activities, in feeding and nutrition, social and family relations, and community leadership — in most of its activities. That has been clear in the high share of women participating in PMN activities, and in specific training in gender issues in the ECAF and Eligessan schools.

Women's participation and empowerment has been tracked in the potato supply chains. Gender perspectives have been included when considering policy impacts, and

in discussions with government agencies, community organisations and NGOs.

Capacity and behaviour changes

In the groups with which the project was working — NER, ECAF, Eligessan, home gardens — there was a high percentage of women's participation. They had acquired confidence and skills to speak in public. They had taken the initiative in potato production, such as care of the soils and the management of the use of herbicides and fungicides. They had also taken the lead in producing foods with high nutritional value, such as in the breeding of small animals and home gardens.

Results

Generalised results in women's empowerment are not that easy to demonstrate, although specific instances can be seen. For example, it is worth highlighting the process being carried out in San Diego de Muellamués, Guachucal, through the ECAF; where the women participants were learning to recognise not only their current roles, but also to see themselves as active producers and income-earners.

There, the creation of the savings fund managed by women represents a learning experience aimed at gaining skills towards autonomous management, planning, projection towards the future and strengthening the organisation with gender identity. The women expected the savings fund to constitute a credit support, supplying working capital for activities such as guinea pigs. This constitutes a pilot experience in smallholder zones from a gender perspective, since limited access to land means that activities need to have high yield per unit area

Impacts

The impact of actions to empower women on policy is limited by institutional weakness, since other aspects of the public agenda are prioritized, especially at national, regional and in particular at local level. The situation of rural women in Colombia is critical. Although their situation in terms of income, employment and social protection has improved in recent decades, they continue to be at a disadvantage compared to rural men and urban women. They are more likely to be poor, are less well paid and, for the most part, have an informal job, with few benefits for maternity, disability or illness.

In this sense, a strong contrast can be seen between the processes that the project has created, with important advances, and the institutional weakness at all levels in that are at variance with the cultural, social and political transformations that the project encourages.

The project is filling an important void in public policy for gender in rural Colombia; a void marked by serious and worrying discrimination and exclusion of women. The methods and processes advanced by the project, from the recovery of the value of women in all rural life, can contribute to national change, incorporating the practices and procedures of the project, if only a strategy of change for the rural woman can be formed at central level.

2.2.4 Influencing policy

Activities carried out

The PMN project has sought to influence policy at national, departmental and municipal levels.

At the national level, the project has active links with the ministries of agriculture and health, and with the Colombian Agricultural Institute (ICA) and the National Institute of Health (INS): links that work to exchange information and plan common actions. This includes events at the national and departmental level in convening policy-makers to present project results and discuss their implications.

In the longer term, a course at the level of the master's degree in FNS was established in 2014 at the UNC, to train personnel with capacity in FNS.

In Nariño the project has had considerable influence on policy for food and nutrition security. Close links have been formed to the health department; and with the governments of the five municipalities where the project has carried out its work. Information and perspectives have been exchanged, actions coordinated, and municipal staff have been trained. The project team has been very active in these aspects: more than what could have been

Changes in capacity and behaviour

We did not have time to investigate to what extent the project's actions have had an influence on national policy.

In Nariño, the main point of political influence on vegetable gardens and food and nutrition security

education is the local level; consisting of specific support to the four municipalities of southern Nariño that are classified at the lowest level of the budget level (category 6). The project sensitises and seeks the commitment of the mayors. This was confirmed in Cuaspud -Carlosama, where specific support in agro-ecological workshops, traditional cooking, and recuperation of native seeds has been given, within the framework of food security and sovereignty. Similarly, in the municipality of Túquerres support has been given in the promotion of the improvement of the nutrition of the community and contributions to food sovereignty. In Guachucal, Municipal staff have been trained to gain skills in methods, techniques and indicators to measure the nutritional status of the community. The work between the health secretariat and the municipal agricultural technical support unit (UMATA) has been stimulated.

The same happens at the departmental level with the government; again, in very specific aspects or facilitating the intervention of the government in the municipalities of the project around the issue of food security and sovereignty. Influence was also seen in social organisations such as AICO of the indigenous Pastos with whom a relationship of respect, recognition and support to processes within the framework of food security and sovereignty has been generated.

That said, national entities seem to be far from involved in local processes, especially at the municipal level.

Interviews with departmental officials responsible for FNS, and with the staff of the municipalities, revealed a considerable appreciation of the project. They shared perspectives on food and nutrition security and how to improve the nutritional situation. They value the support that the project had given them in information, dialogue, training and planning.

The Eligessan schools had formed leaders in the communities that were now able to contribute to formulating proposals and actions at the municipal level. This was especially important in indigenous issues, since several of the Eligessan were located in indigenous territories; and gender, since the Eligessan had given an important opportunity for political participation for women leaders.

There was not so much policy influence in matters of agriculture, although at least in one of the municipalities, Túquerres, the municipal policy and the direction of the project were well aligned.

Results

In Nariño it was clear that, in terms of FNS, the project had achieved everything that could have been expected from a research project. At the formal level, in the departmental government and the municipalities, the results of the project and the processes initiated by the project were accepted and welcomed.

The result has been that the government of Nariño intends to extend the Eligessan leadership schools to another thirteen municipalities. It has ordered reprinting of two manuals produced by PMN on home gardens and on traditional cuisine of the region.

At a less formal level, in the communities, social and political processes have been stimulated by the project: by forming leaders and managers, giving more opportunity for indigenous people and for women, by the activities of the home garden groups. These have benefits not only for policy and practice for food and nutrition security, but also for the rights of women and indigenous groups, and for social reconciliation in territories where the armed conflict only recently ceased.

Impacts

Influencing policy is above all a process, so that impact is seen in processes of participation in local decision-making. At the time of this study, quite significant effects could be seen in the municipalities and communities of Nariño where the project works: the ideas and ideals of the project, its working methods have been influential with local authorities and leaders. The achievements have been greater than could be expected from most research projects.

3. Analysis of Papas Más Nutritivas

3.1 Research partnership and policy influence

3.1.1 Research partnership

The cooperation facilitated between McGill University in Canada and the National University of Colombia (UNC) has been fruitful for both institutions. On the Canadian side, professors and students have benefited from being linked to a dynamic and active project, which has provided them with opportunities to carry out empirical studies, and to get involved with practical dimensions of food and nutrition security, and indeed, of development, in rural areas.

On the Colombian side, the link with Canada has been used to exchange ideas, to take advantage of the knowledge and perspectives of the McGill staff, and to train jointly young UNC students. Most of the contribution of Canadians has not been in basic science and high technology; but more in bringing additional perspectives on rural problems and how to carry out action-research. The value of an active and frequent exchange, in stimulating thought and activity, should not be underestimated either.

The achievements of the project in forming young students have been notable. For Colombians in their postgraduate studies at UNC, the opportunity to participate in the project and carry out empirical studies has been very valuable. It complements hugely studying purely in the library, the laboratory and the classroom. When we met the young Colombian postgraduates, it was extraordinary to see the great variety of studies carried out, and the enormous enthusiasm of the students for the project and the opportunities that it has given them.

Two more reflections fit here. One is that the leadership of PMN has managed to form a multidisciplinary project, one in which the interaction between the natural and human sciences has been very productive. This has involved a special effort on the part of the project leaders.

This is linked with the second observation. *Papas Más Nutritivas* has been a very active project with many

achievements and an exceptional level of activity. This results in part from the willingness of the project staff to work many more hours than formally expected or funded. It also results from a leadership, both Colombian and Canadian, of persons of considerable ability. CIFSRF has financed a project with significantly above average personnel.

3.1.2 Policy influence

In this respect, the project can be divided by its two main components. On the one hand, the multiplication and dissemination of potato varieties is a relatively technical exercise, focused on creating new systems to produce quality seed. The challenges are substantial, although the changes in the Colombian society and economy attempted are limited. The PMN project team has done all it can to influence the policy for potato and its seed, forming links with entities such as Fedepapa, exhibiting in the AgroExpo, and engaging with the Ministry of Agriculture.

On the other hand, in trying to change the situation of the FNS in Nariño, the project takes on larger challenges; because the changes required not only are substantial, but also they affect several components of the society and economy. In some respects, they involve engaging in complex debates: issues such as gender, the future of indigenous communities, a more sustainable and ecologically viable agriculture, are challenging both in deciding goals and in defining the means to achieve them. Within this context, the team has been both highly active and thoughtful, but not at the cost of replacing or delaying action in the field. This approach has been well received in Nariño by both the authorities and the participants. The project has had notable influence on public policy and action in health and nutrition agencies in the department at all levels in the areas where the project has worked.

It is less obvious how much influence in national politics and thought this work has had. In any case, it is likely that lessons from Nariño have to be seen within their regional context: actions and approaches that work in one department will not necessarily work in the same way in other regions.

It would be useful, perhaps, to document the experience of the project, to extract lessons and principles that may

be useful in other parts of Colombia, and in other countries as well. But the difficulty of doing this is that the results of the actions of the project in some domains, such as gender, will only be evident in the longer run.

3.2. Specific findings

3.2.1 Food and nutrition security

The project has done much with participants in Nariño to improve their food and nutrition security. Participants reported changes in their daily practices: in more diversified diets with more fruit and vegetables; in improvements in hygiene; and in feeding young children.

For participants in the home gardens, notable improvements in diet diversity were recorded, a rise from 18% to 53% of households reporting a diverse diet; as well as for perceived food security, with a rise from 19% to 59% of participating households saying that they felt food secure.

For the micro-nutrient powders, mothers felt that the powders were leading to better health of their young children; but more precise measurement of such changes remains to be done.

3.2.2 Incomes

Of the potato seed growing groups, three of the four most established were showing profits to their group enterprises. The other group had still to bring their costs down.

The home gardens had generated material benefits in gardens mostly in fruit and vegetables for domestic consumption.

3.2.3 Sustainable agriculture

By March 2018, the production of potato seeds of the new varieties had seen sufficient to plant up 734 hectares: or around 16% of the area planted to yellow potato in Colombia. Much of the potato seeds, however, came from individual commercial seed growers: the contribution of the groups nurtured by the project was a minor part of this.

Regarding the home gardens in Nariño, the project had made notable efforts on revitalising the production of local varieties of potatoes, fruits and vegetables, and

hence to preserve biodiversity and cultural heritage. It also promoted the use of organic and natural fertilisers and pesticides to reduce use of manufactured agro-chemicals.

It was remarkable to hear how much participants favoured such approaches in agriculture. Of those participating in the ECAF schools the end-line survey showed 87% reducing use of agro-chemicals, 62% adopting soil protection, 50% handled agro-chemicals safely. Some 54% of participants had planted a garden at home.

3.2.4 Gender

The PMN project has significantly emphasised gender. Actions not only include the appreciation of the roles of the different sexes in the ECAF and Eligessan schools; but the project also works primarily with rural women, in addition to the fact that most of the field team is female, giving a very clear example of the roles and skills rural women can achieve. In addition, the project has highlighted aspects of gender in indigenous communities, in some of which a particularly strong macho culture has prevailed in the past.

Measuring changes in gender relations and improvements in the lives of rural women and girls in the short term is difficult. However, it was noted in the discussions with the female participants that they were satisfied with the orientations regarding gender, and reported improvements in the relationships between the sexes — more respect for women, greater understanding of the roles of women, and less abuse by men.

3.2.5 Unexpected results

The project exceeded expectations in working with indigenous communities of Nariño. When the PMN project contemplated working in such communities, it was recognised that this might not be easy, given the longstanding experiences of deprivation and discrimination of the communities, and their more recent history of conflict. However, the acceptance of the project in such communities has been good, with significant results.

3.3 Sustainability and scaling up

As regards **multiplication and dissemination of the new varieties of yellow potatoes**, much depends on the economy of seed potato production. If it becomes a profitable and attractive activity for the four associations that now produce seed, it will be sustained.

Three conditions will determine success. First, the group members need to internalise the technical challenge involved in producing seed. This depends partly on capacity, partly on attitude and pride in producing quality seed. Seed growing is an unusually demanding aspect of agriculture. The UNC team demonstrates all the qualities to inculcate technical expertise, and pride, in the associations: they know the techniques and have instilled rigorous procedures with the groups and their members. The groups probably need to be accompanied through two cycles of multiplying the seed from the elite to registered seed, cycles that last 18 months each.

Second, for at least one the groups production costs need to be reduced so that there is an adequate margin between costs and the value of the seed in the market. During the first cycle of multiplying seed, rigorous techniques have driven up costs—beyond what is economically sustainable in one case. The UNC team recognises the challenge of economising in the second cycle of multiplication.

Third, the market for quality seed has to be established. So far some potato producers are willing to pay for guaranteed quality seed, thereby absorbing current production of seed. It remains to be seen to what extent other potato growers are prepared to pay for registered seed of the new varieties.

The sustainability of potato seed growing requires a sustained effort of several years, and probably a longer period than that covered by the financing of the second phase of CIFSRF. The UNC team in Bogotá, however, shows a clear commitment to continue with this work, as will be explained in the following section.

The UNC teams plans not only to sustain the effort with the four associations, but also to extend the action to other departments. By participating in the AgroExpo, the project made contacts with producers and groups in the departments of Santander, Boyacá and Valle. These

include the possibility of collaborating with 300 producers who work with a Swiss NGO. Already the UNC team has been to the field in these departments to start work.

This depends on funding to sustain activity from March 2018. It is possible that the team will have access to small projects funds, and can collaborate with bodies, such as the Swiss NGO, which has funds for similar actions. It is still to be seen, however, if these will be sufficient to finance all the actions contemplated.

It is also planned to collaborate with Fedepapa in disseminating varieties, and to look to set up a national system for quality seed.

Moreover, it seems that Agroideas' sales of mini-tubers of the new varieties to commercial seed growers have flourished in 2017 and early 2018 which offers the prospect that the new varieties may be taken up at scale by commercial farmers.

All in all, it seems that the prospects for sustaining and scaling up the new varieties are quite good.

A more general point for sustainability concerns the marketing of novel produce, such as the new varieties potatoes. The central problem at this point is similar to those that characterise family economies in Colombia: the lack of information on the markets for produce that, in addition to self-consumption, have a growing demand. This applies especially to produce likely to appeal to the new consumers who value products that are environmentally clean, that are diverse, and that have interesting characteristics both in terms of food and medicine. This is a challenge: the project team is thinking about exchange networks, and about sales both domestic and external.

In this sense, the articulation of the produce from the home gardens with the research project becomes strategic, because the produce results from the dialogue of knowledge, with a good possibility of sales, since it defends traditional knowledge, and indeed helps create a new consumer of produce from a system that has recovered practices of environmental sustainability.

It is also a way to connect rural areas with indigenous communities to urban centres, where options are open to

users of natural products both nutritionally and in terms of health. If such connections can be made they would help sustain and expand PMN efforts.

With respect to the actions to **promote food and nutrition security in Nariño**, the use of micro-nutrient powders is part of a national programme. Hence sustainability depends on the Ministry of Health, which in turn depends on the effectiveness of the programme and the need for it — in the long run it will not be necessary, since the children's diets will be sufficiently nutritious to eliminate the need for supplementation.

As for the ECAF and Eligessan schools and associated networks of home gardens, efforts may be replicated and continued through financing by departmental and municipal governments, or by financing from an external donor or an NGO. To facilitate this, the project will document the ECAF methodology. In early 2018 came the good news that the departmental government was indeed planning to extend the Eligessan schools across thirteen municipalities, as well as to print up copies of the manuals written by the project on home gardens and traditional cuisine.

Moreover, the networks of community gardens may well be sustained by the communities where they operate. Much depends, in these cases, on the local leadership and the willingness of the community members to continue the work by themselves; a will reinforced by the appreciation of the value of collective efforts.

Overall, at least some of the PMN initiative looks likely to be sustained and scaled up. CIFSRF funding has made this possible, although the question of whether more funding over one or two more years would make a substantial difference to sustainability and scaling up remains as pertinent as it is difficult to answer, other than by inspired judgment.

The question, moreover, has more than one facet, since the actions necessary to scale up the new varieties of potato differ from those needed to scale up the schools and home gardens. The former may achieve scale largely through commercial initiatives that can readily be

replicated across the areas of Colombia suited to potato growing. The latter, however require public and collective action; with models that will require adaptation to differing social contexts.

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Annex A Itinerary and people interviewed

Dates in September 2017	Event	Place
Sunday 10	Wiggins arrived in Colombia	
Monday 11	Interviews with producers of the NER ASOPAPA: 15 members of the group, roughly equally men and women farmers, at their fields	Sibaté, Cundinamarca
Tuesday 12	UNC team presentations, including meeting with students who had been involved in PMN research	UNC, Bogotá
Wednesday 13	Interviews with Deans and colleagues at UNC Interview with the project administrators Flight to Pasto	UNC, Bogotá
Thursday 14	Presentations by 18 members of the project team Meeting with officials of the State Government of Nariño in FNS and health: 4 persons, at their offices Meeting with departmental leaders of AICO in their offices, 3 of them present	Pasto, Nariño
Friday 15	Interview with the head of agriculture, municipal government, Túquerres, 2 persons Visit to San Diego de Muellamués, Guachucal ECAF: focus group discussions with producers — two groups of around 25 members, all women farmers CDC visit to home gardens group, San Diego de Muellamués — 12 persons present, in the collective garden Meeting with the Guachucal UMATA: two persons, agriculture and health staff	Túquerres and Guachucal, Nariño
Saturday 16	Visit to Eligessan, Cuatro Esquinas. Group with 15 women and girls, met during class on traditional cuisine Visit to Eligessan, San Diego de Muellamués. 12 farmer members, more women than men, met on farm Visits to producers of the NER COOPROLAC, Loma Larga. 10 members present, 6 men and 4 women, met at potato plot	Túquerres and Guachucal, Nariño
Sunday 17	[Home work]	Pasto
Monday 18	Visit to El Socorro, producers of the NER, ASAAIS. 15 members of the group, roughly equal men and women, at potato plots and at the group's offices. Meeting with three members of a local Eligessan, and two persons of municipality of Carlosama, at municipal offices	Pasto, rural area Carlosama, Nariño
Tuesday 19	Meeting with leading members of the project team	Pasto
Wednesday 20	Return to Bogotá by bus	On bus

Thursday 21	Discussions between authors	Bogotá
Friday 22	Meeting with leaders of the project	UNC, Bogotá
Saturday 16	Wiggins returned to England	
