ARMENIA
2021-2041
ideas in action

Armenia 2021–2041

Agriculture deep-dive

May, 2021

This document is a summary developed in partnership with "ARMENIA 2041" Charity Foundation. We emphasize that McKinsey's role in the project was only in terms of data provision and conducting analysis.

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Table of contents – detailed vision by sector and by enabler

Agriculture

Agriculture – summary of diagnostic

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Background

- Production historically concentrated on low-value crops (cereal beans, lentils), partly due to lack of irrigation
- Relatively high regional concentration (over 60% of yield stems from 4 regions)
- Land ownership fragmentation leading to low land utilization
- Farming does not leverage the latest practices, with poor use of machinery and mineral fertilizers

Economic contribution

	2019	Δ2014–'19
Gross value added, USD mln	1,527	-17% ▼
Employment Headcount, thou	236	-40% ▼
Productivity Gross value added/ employee USD thou	6.94	51% ▲

Sector-specific KPIs

	Armenia, 2019	Armenia, 2014–'19 change	Peers average, 2019	Leader-peer, 2019
% of area used as agricultural land	59%	+0 p.p. =	49%	71%
Production, mln tonnes	2.7	-32.1% ▼	102.0	154.4
Yield, tonnes/ha	8.4	-18.4% ▼	5.8	8.5
% of high value crops	3.72%	+0.83 p.p. ▲	2.41%	5.45%

> *Armenian export potential is limited by low food safety standards, especially in meat and dairy production, inhibiting our entry to the EU market*
>
> **Agriculture Expert**

> *Productivity and exports in agriculture could be significantly increased by focusing on higher value crops (e.g., wine and dried fruit), but that would require a significant supply of water*
>
> **Agriculture Expert**

> *Excessive fragmentation and privatization of small areas of land create an obstacle for efficient farming, as households cannot achieve economy of scale on their own*
>
> **Agriculture Expert**

Key success factors

1 Focus on high-value crops
- Shift production from cereals and lentils towards high-value crops, e.g., berries and flowers

2 Infrastructure development
- Construction of roads and storage facilities is required to increase production and shift towards high-value crops

3 Food safety
- Improving food safety standards and compliance with ISO 22000 could enable exports to EU countries

4 Sustainable irrigation
- Development of water storage and irrigation systems as a key resource and cost reduction factor and productivity boost

5 Incentivizing efficient arable land utilization
- Incentivizing households to cultivate land with provision of expertise will increase the share of arable area use

Agriculture's contribution to GDP and employment has been shrinking in Armenia in line with development trends

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2009 2019 XX CAGR 2009-'19

	Share of agriculture, forestry, and fishing, value added in GDP, %		Share of population employed in agricultural sector, %		Contribution of agricultural trade to GDP, %	
Armenia	17.9% 12.0%	**-3.9%**	39.5% 24.1%	**-4.8%**	-5.6% -0.9%	**12.2%**
Iran	6.9% 12.2%	**5.8%**	20.9% 17.4%	**-1.8%**	-1.3% -1.7%	**2.2%**
Moldova	8.5% 10.1%	**1.7%**	28.2% 21.0%	**-2.9%**	2.2% 4.0%	**7.4%**
Ukraine	7.2% 9.0%	**2.3%**	21.3% 13.8%	**-4.2%**	4.3% 10.8%	**4.5%**
Belarus	8.1% 6.8%	**-1.8%**	11.4% 11.1%	**-0.3%**	0.2% 1.6%	**12.0%**
Georgia	8.1% 6.5%	**-2.2%**	49.4% 38.2%	**-2.5%**	-3.5% -2.0%	**10.6%**
Azerbaijan	6.1% 5.7%	**-0.7%**	38.1% 36.0%	**-0.6%**	-0.9% -2.1%	**5.7%**
Russia	4.1% 3.5%	**-1.5%**	8.3% 5.8%	**-3.4%**	-1.2% -0.5%	**5.7%**
Turkey	8.1% 6.4%	**-2.3%**	23.0% 18.1%	**-2.3%**	0.4% 0.3%	**5.0%**
FSU Average	7.1% 7.5%	**0.5%**	25.0% 20.2%	**-2.1%**	0.0% 1.3%	**5.6%**
France	1.3% 1.6%	**1.9%**	1.3% 2.5%	**6.7%**	0.3% 0.4%	**0.1%**
Ireland	0.6% 0.9%	**5.0%**	2.9% 4.4%	**4.2%**	0.9% 1.2%	**1.8%**
Netherlands	1.6% 1.7%	**0.6%**	5.6% 2.1%	**-9.4%**	3.1% 3.4%	**1.4%**
Aspiring peers average	1.1% 1.4%	**1.9%**	3.1% 3.0%	**-0.4%**	1.4% 1.7%	**0.9%**

Key considerations

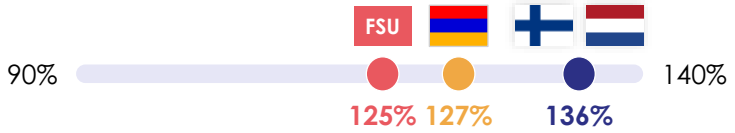
As economies develop, the contribution of the agricultural sector to GDP and employment decreases, while trade contribution to GDP rises

Armenia has a large gap in trade contribution to GDP (e.g., compared to Moldova), suggesting room for improvement

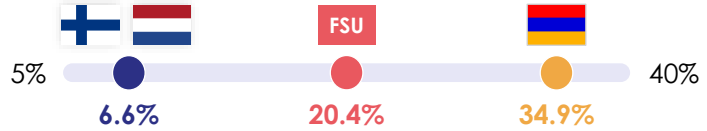
While the agricultural sector in Armenia provides adequate dietary supply, it has not yet reached self-sufficiency in critical crops

Key food security metrics

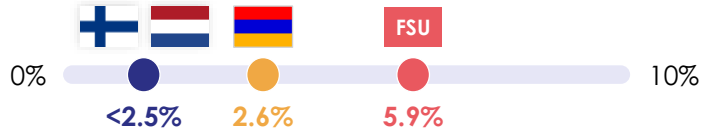
Average dietary energy supply adequacy (2017–'19 average), %



Prevalence of food insecurity in the total population (2017–'19 average), %

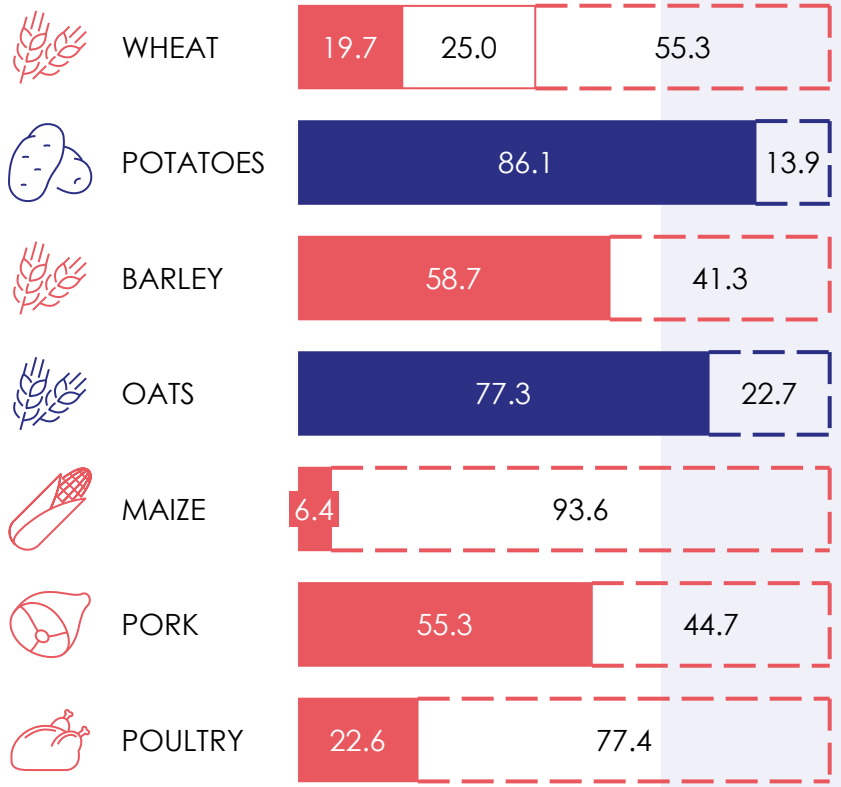


Prevalence of undernourishment (2017-'19 average), %



Self-sufficiency in critical crops in 2019, %

Wheat imported from lost Artsakh lands | Production gap



Key takeaways

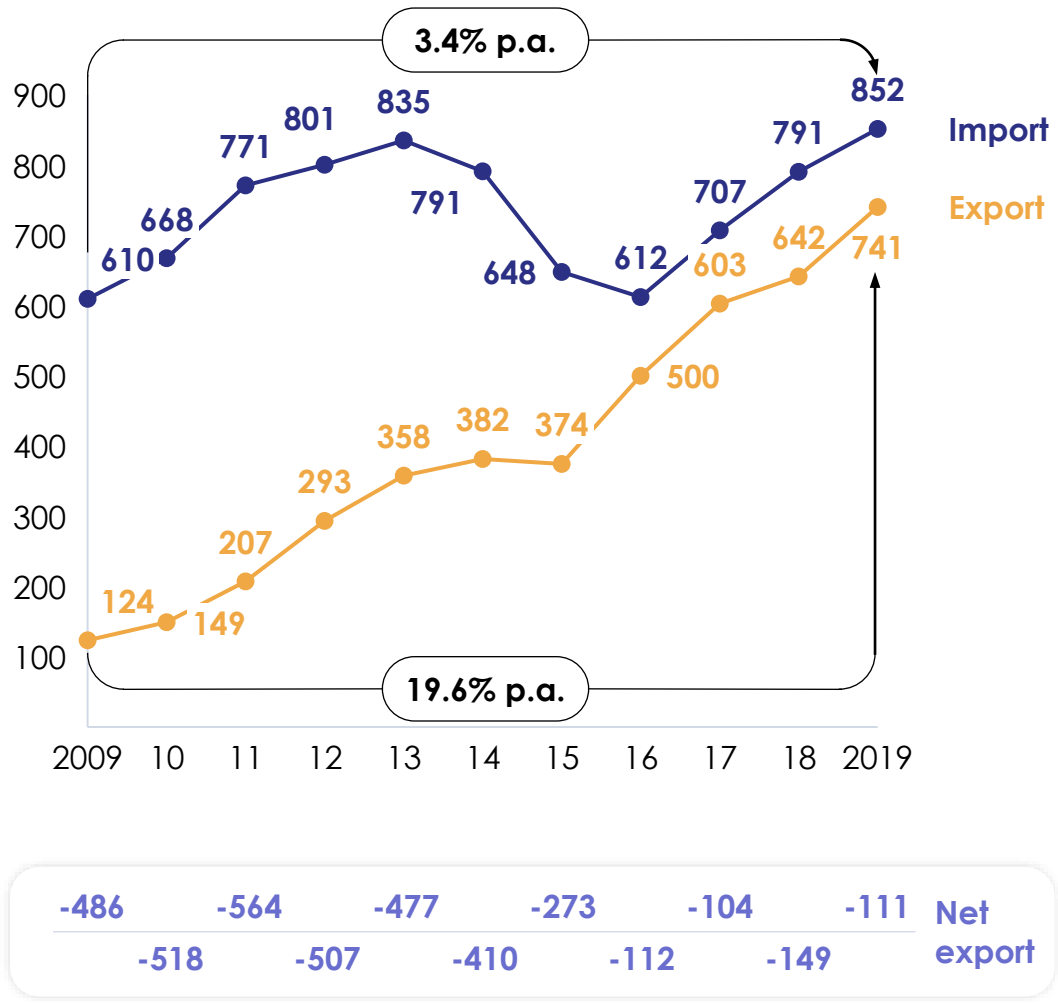
Armenia's agricultural sector provides sufficient food supply with **low levels of undernourishment**

Lack of self-sufficiency in crucial crops and inadequate infrastructure put Armenia in a vulnerable position

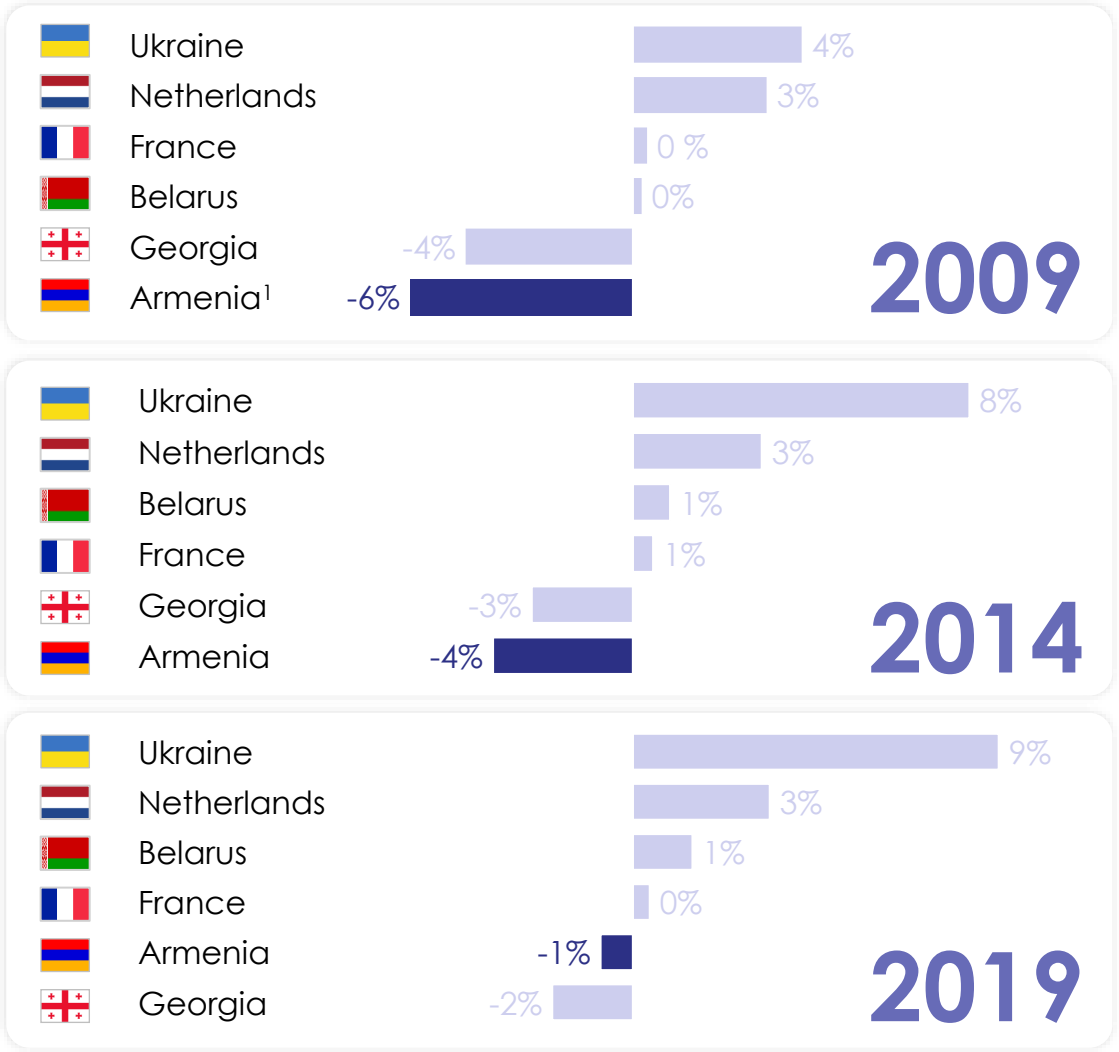
Given its landlocked position, **food security should be considered a top priority**

Over the past 10 years Armenia has been closing the gap in net imports of agricultural goods

Trade volume, constant USD mln



Net exports of goods & services vs selected peers, % GDP



1. Armenia – 2012

Source: The Observatory of Economic Complexity; UN Comtrade

Improving yields and land utilization are the key levers for growing Armenia's agriculture

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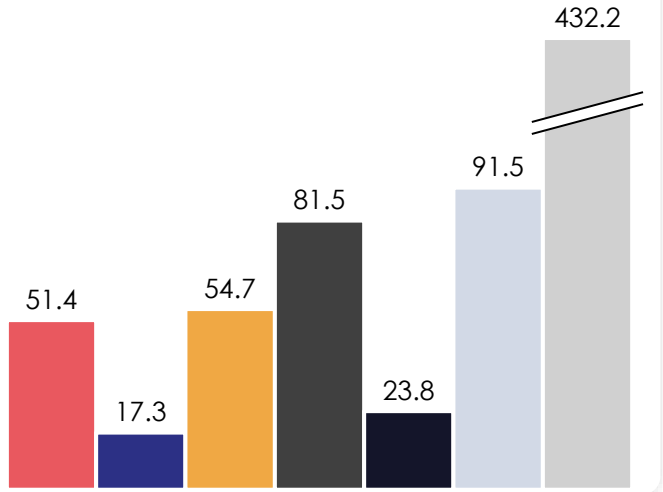
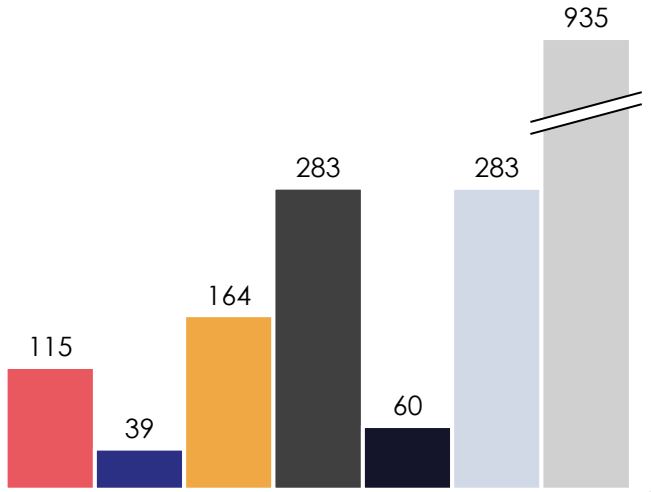
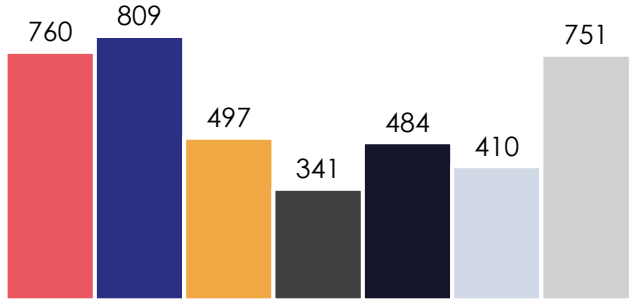
Gross output, USD per km²



Production volume, tonnes per km²

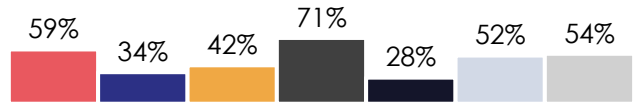


Value per tonne of harvest, USD

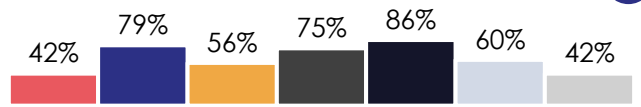


Armenia
Georgia
Belarus
Ukraine
Iran
France
Netherlands

Agricultural land, % of total land area



Harvested area, % of agricultural land 1



Yield, tonnes per ha 2

Detailed later

Crop & livestock mix 3

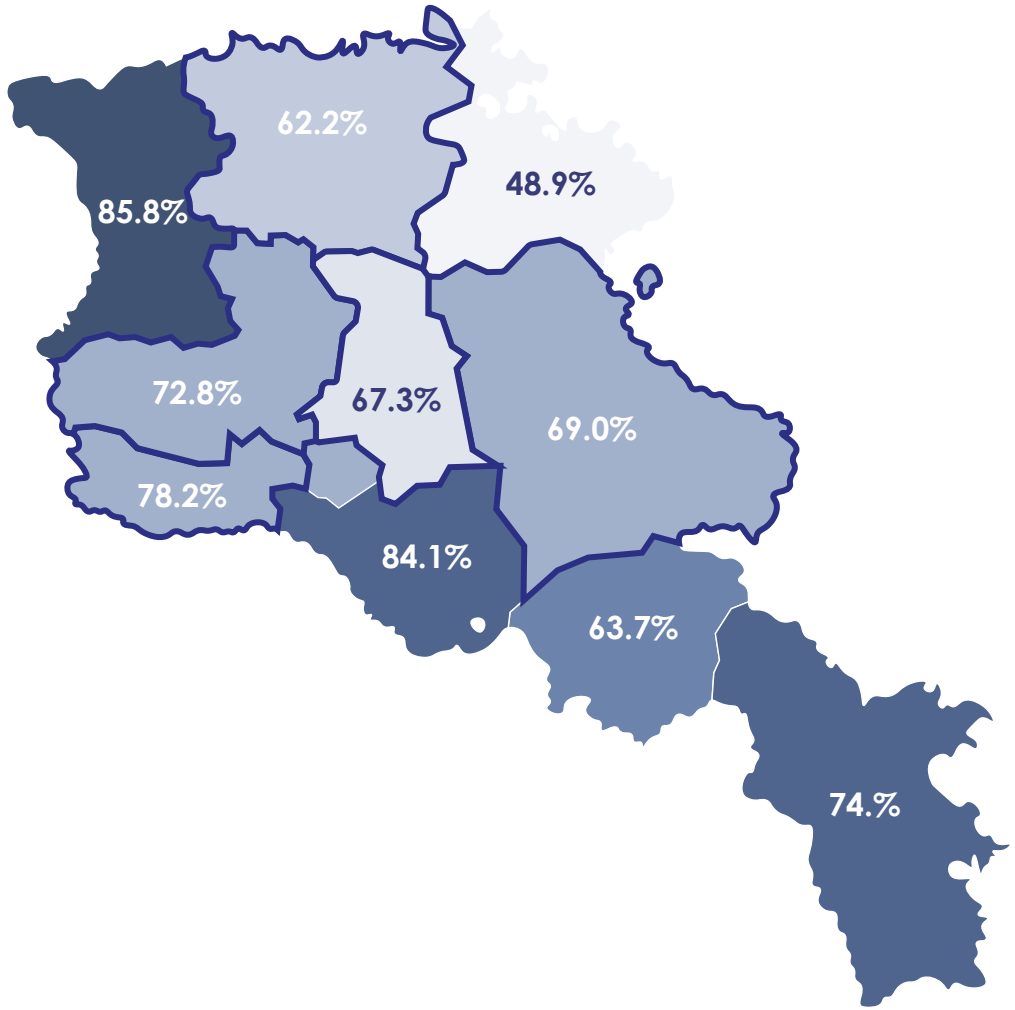
Input quality

Will be considered in Enabler section

Source: FAOSTAT, World Bank

1. Reactivating cultivation of unused agricultural lands is the key to unlocking agricultural sector output

Armenia arable land utilization rate 2019, %



Arable land 2019, thou ha	**459**
Underutilized land 2019, thou ha	**126**
Total land utilization	**72.6%**

By prioritizing **5 regions** with the largest areas of unused land (Aragatsotn, Armavir, Lori, Kotayq and Geghakunik) Armenia could unlock up to **84,000 ha** of uncultivated land (**67% of all land** currently not being cultivated)

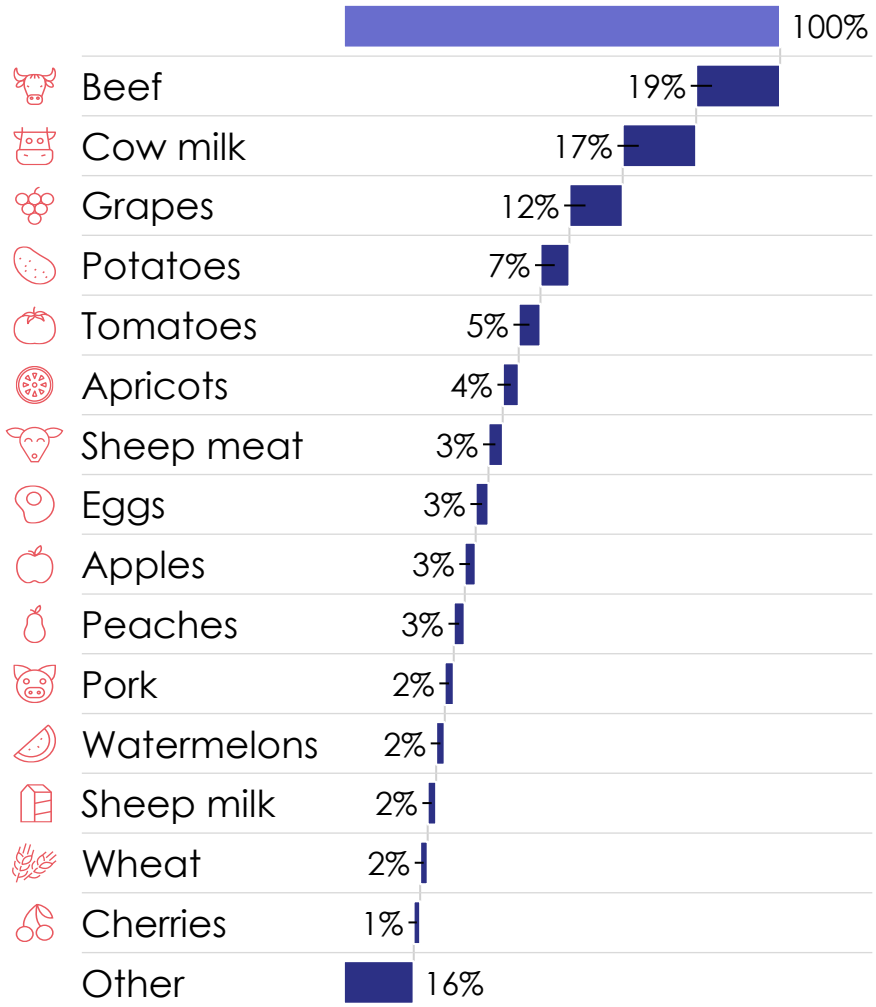
Source: Armstat

Key considerations

- Most under-cultivated land is currently owned by the government or community, whereas average land utilization in the private sector reaches 70%
- High fragmentation of privatized land remains a key obstacle to optimizing land utilization
- Possible ways to enable higher land utilization include the creation of government-backed land data banks and incentivizing cooperation among small farmers

2. Yields of the majority of crops and livestock products could be significantly improved

Key crops & livestock products in Armenia,
% of total output in current USD



Yield gap compared to Armenia, %

Aspiring peer	Peer set average
250%	80%
280%	50%
0%	0%
110%	0%
1250%	0%
70%	0%
190%	70%
10%	0%
420%	40%
80%	0%
20%	0%
0%	0%
70%	0%
380%	50%
100%	0%

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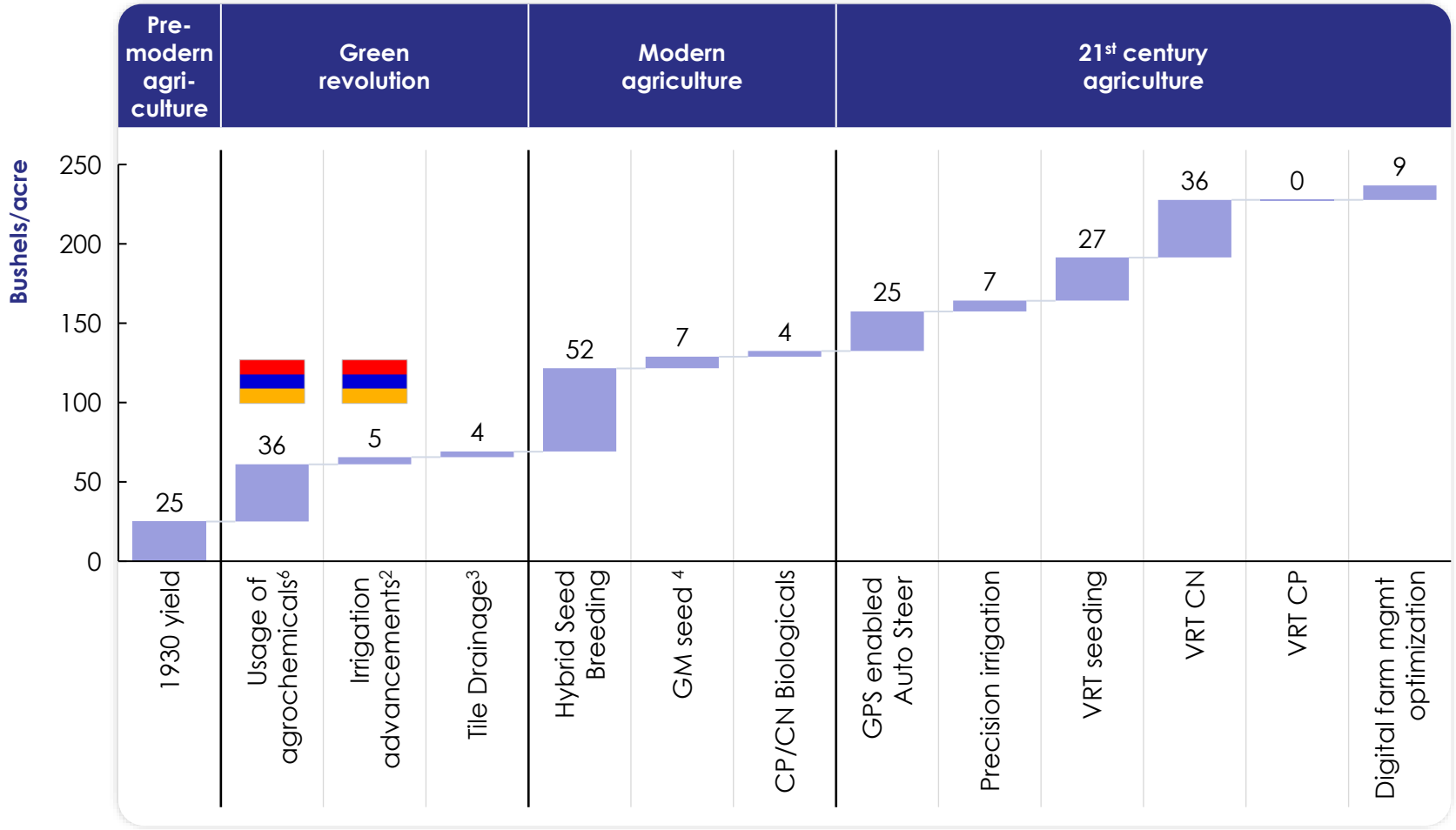
Key considerations

Armenia has **comparable average yields** with neighboring Georgia, but it **falls behind in yields of food security-crucial products** (meat, dairy and cereal)

Closing the gap between Armenia and aspiring peers could **unlock an additional USD 3 bn of gross output**

There are multiple levers that could be pulled to increase yields (example of corn bushel yield improvement)

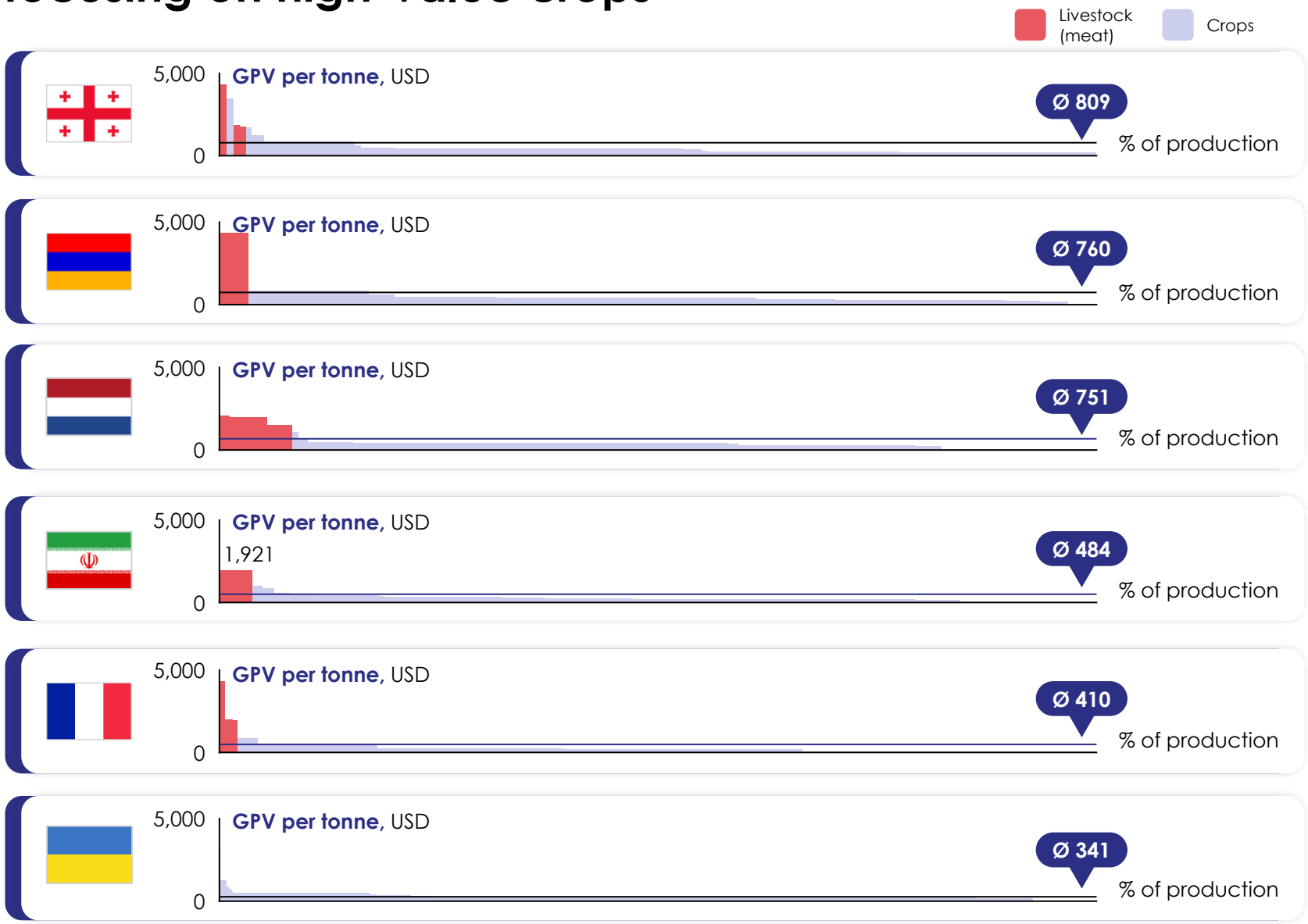


1. Numbers are constructed to account for US yield until 2010s. Numbers for 21st century and later technologies may not be additive and are inherently uncertain. Note also that the numbers are meant to account for changes in the national average and are thus possibly lower than the yield uplift per technology observed on an individual farm
2. Irrigation is not applied to all farms in the US, so uplift is likely higher for individual farms 3 includes advances from increased plant population 4 Biologics such as Monsanto Quickroots, seed coatings, or inoculants

Source: Team analysis

Seeds, crop protection, crop nutrition, irrigation and technological applications will be further considered in the Enablers section

The overall production mix for Armenia remains balanced, yet average value per tonne could be improved by focusing on high-value crops



Source: FAOSTAT

Key considerations

- The Georgian example suggests that the Gross Production Value of Armenia's agricultural sector could be further improved in crops by shifting attention towards high-value crops (e.g., garlic, cherries and apricots)

The optimal agricultural mix for Armenia can be identified by a comprehensive multi-layered analysis

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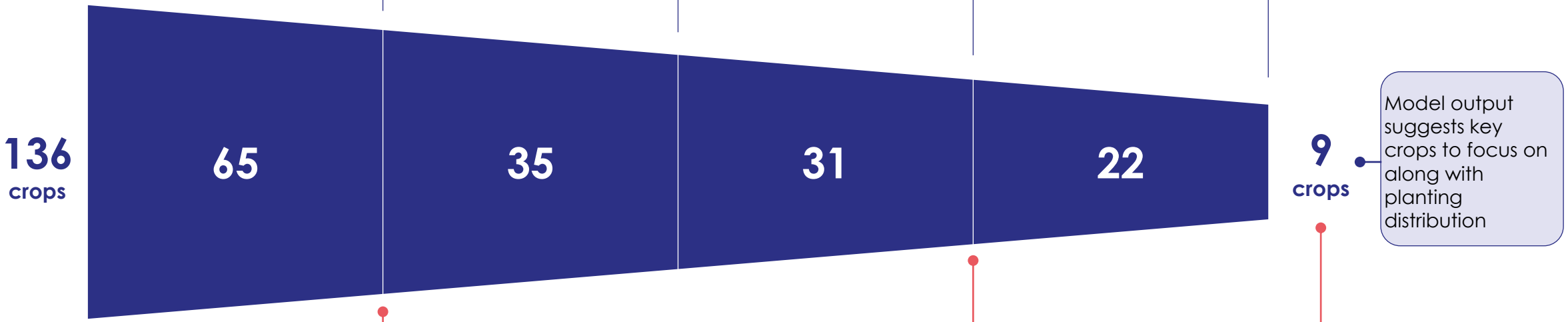
A Typical crops
What are the typical crops that are grown in a given country and neighbor countries?

B Climate conditions
What crops are climatic conditions suitable for?

C Soil conditions
What are the soil conditions under which the crops can grow?

D Feasibility
What level of maturity is there in the country (farming cap-abilities, farm size…)?

E Economic value attractiveness
How much value can be extracted from the crop value chain?



Rages of temperature, altitude, amount of rainfall for optimal crop conditions are compared against local conditions at the most granular level

A feasibility check is conducted looking at operational and economic conditions in the region/country

Hazelnuts, berries, lentils, peas, maize, sunflower, linseed, tomatoes & grapes

Table of contents – detailed vision by sector and by enabler

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Agriculture

The global agricultural landscape is being shaped by 5 key trends

Global trends in Agriculture

Digital & tech disruption

Rapid growth of the **AgTech industry** is helping farmers to **increase yields** and optimize processes across the value chain by leveraging data, robotics, biotechnology an IoT solutions

Growth of healthy & organic foods

The shift in consumer behavior towards **health and wellness** is driving transparency and new products and brands, along with demand for **organically grown foods**

Dairy consumption growth

Dairy remains a **high-growth sector** with most of its growth coming from the **emerging markets**

Protein replacement

Global demand growth for protein continues due to **meat consumption in China,** while there is a shift in global **consumer preferences in developed countries**

Consolidation across the board

Agriculture industry players are **consolidating across the value chain** as they strive to **reduce costs** and **improve margins,** blurring the lines of traditional verticals

Implications for Armenia

Leveraging AgTech solutions and making them accessible for farming SMEs should be perceived as a key lever to increase agricultural output

Small-scale production of organically grown foods with increased margins is a good fit for Armenia given the high level of fragmentation of land and farming enterprises

Armenia could further leverage its strong position in cattle breeding to expand trade in specialty dairy products (cheese) to Russia and the Middle East

While there is still an opportunity to expand meat sales to the developing economies of Russia and the Middle East, long-term growth for meat sales is limited

As the agricultural sector in Armenia continues to grow, consideration should be given to enabling **long-term consolidation** to optimize margins across the value chain

1. Digital solutions already here and at scale

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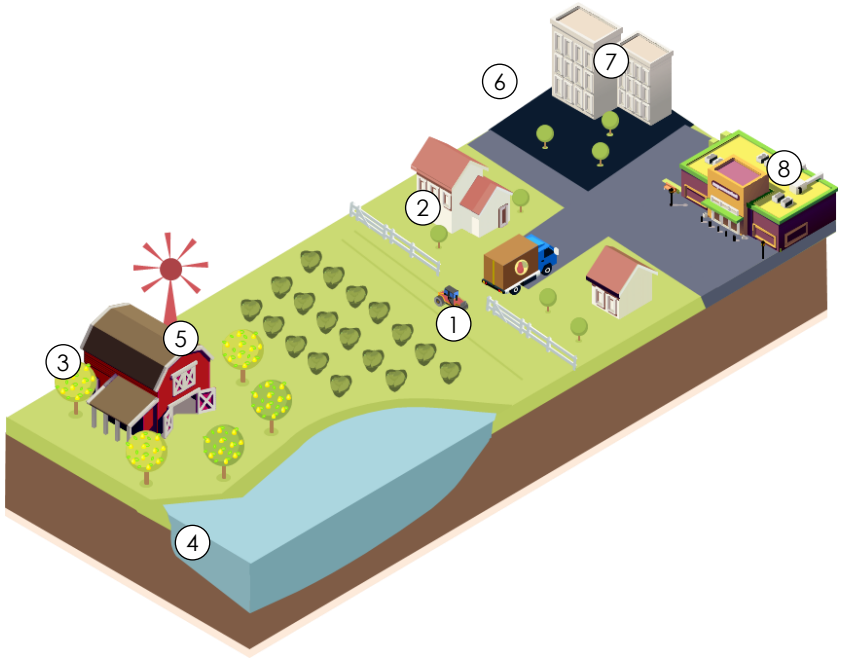
① Sensors
Smart sensors that collect data and help farmers monitor crop health, weather, and soil quality

pycno · SLANTRANGE · Saturas · Phytech · semios · FarmersEdge · Grassometer · flux · SPENSA · Centaur · growmetics · FARMOBILE · ARABLE · amber · Fieldin · Arvaty Agriculture · SMART YIELDS

② Robotics, drones, satellites
Includes drone companies and related drone services that cater to agricultural needs, as well as robots or intelligent farm machines that perform various farm functions more efficiently

FUSE · AgEagle · efarmer · Agribotix · GAMAYA · mavrx · BLUE RIVER · SKYCISION · AIRWOOD · Telefónica · HARVEST · JOHN DEERE · Trimble



③ Animal data
Software and hardware specifically aimed at better understanding livestock, from breeding patterns to genomics

AAD Advanced Animal Diagnostics · Farmnote · TL Biolabs · Mastiline · Connecterra · allflocks

④ Smart Irrigation
Systems that help monitor and automate water usage for farms using various data exhausts

HydroBio · SMART FARM · Sprinkl · AquaSpy · HydroPoint · HORTAU · PowWow · cropx · EDYN

⑤ Next generation farms
Utilizes technology to provide alternative farming methods to enable farming in locations and settings that cannot support traditional farming. Examples include vertical farming and new greenhouses

FREIGHT FARMS · FRESH BOX · GOTHAM GREENS · AeroFarms · BRIGHT FARMS · GREEN SENSE FARMS

⑥ Farm Management Software
Allows farmers to more efficiently manage their resources, crop production, farm animals, etc.

scoutpro · Granular · Agworld · Flowfinity · conservis · Cropio · trecker.com · AgSquared · PICKTRACE · FarmLogs · AgriWebb · FUSE · ONFARM

⑦ Predictive Analytics
Uses big data and predictive analytics to address farm-related issues and make better farm-related decisions in order to save energy, increase efficiency, optimize herbicide and pesticide application and manage risk, among other uses

Aglytix · adapt-N · TeeJet · Strider · prospera · TOPCON · CropZilla · GAMAYA · aWhere · agrilyst · AGCO · bevcentral · CropMetrics · AGRALOGICS · FARMERS · agrobotics

⑧ Marketplaces
Connects farmers directly to suppliers or consumers without any middlemen. Also helps to facilitate physical marketplaces

LA RUCHE QUI DIT OUI ! · YAGRO · Agriconomie · EM3 · AgroStar · Aggrigator

Source: CBInsights

2. Organic food is a rapidly developing industry with a CAGR of 12.2%

- target trading partners for Armenia

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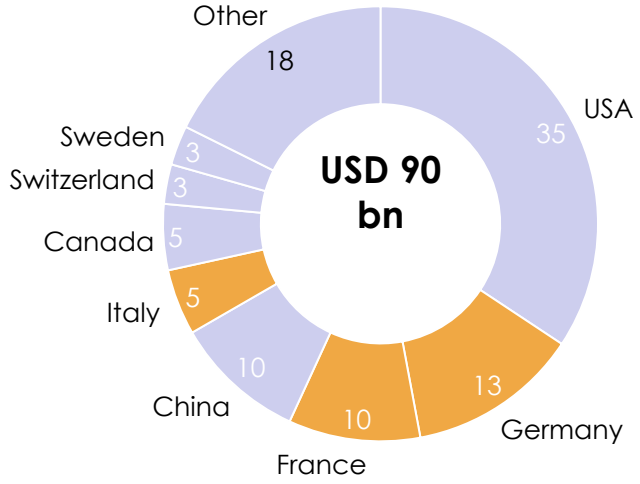
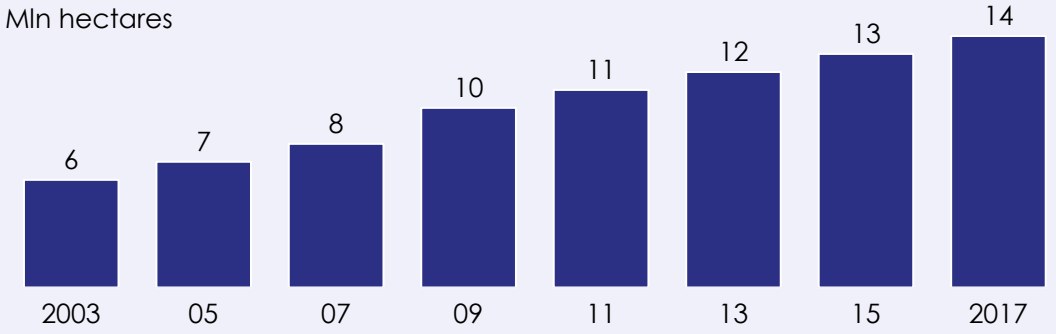
Demand for organic products is steadily growing...

USA, China and **EU countries** (Germany, France, Italy and others) were the largest consumers of organic foods at the end of 2017



… and major suppliers are responding by expanding production



Source: Teller Report, Globe News Wire, FAO, BioFach

3. Dairy consumption remains a stable growth market, with developing economies showing twice the overall growth rate

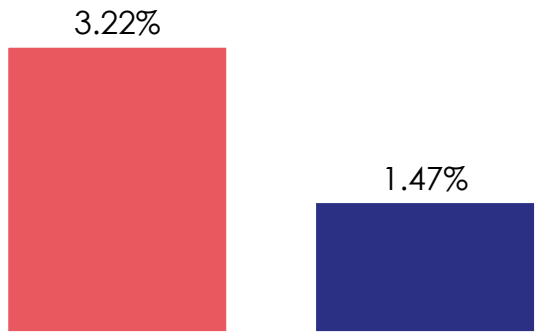
ARMENIA 2021-2041 ideas in action

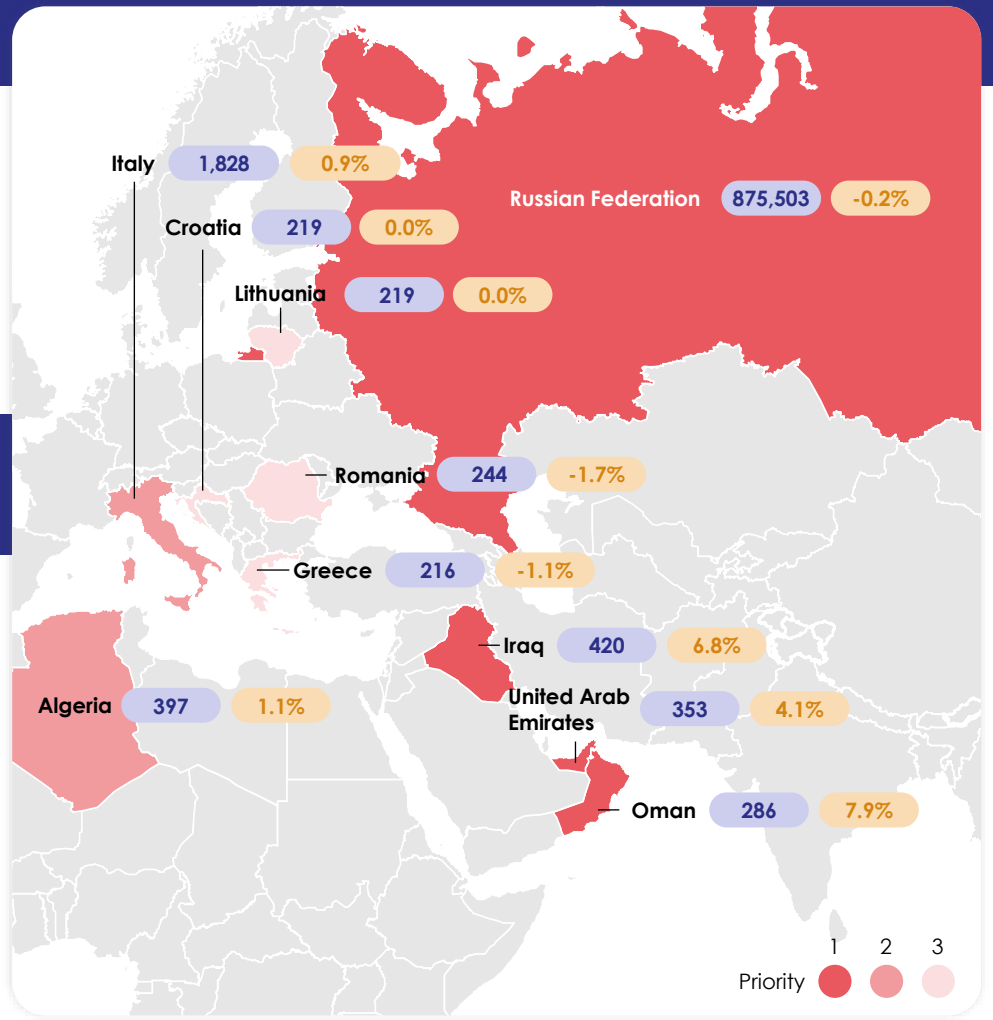
Developing economies | Developed economies | Target countries | xx Net imports 2019, thou tonnes | xx% 10-year CAGR, %

Dairy products remain a steadily growing market

Dairy consumption in developing countries is growing twice as fast as in developed markets

Dairy consumption CAGR '09–'19, %





Source: FAOSTAT

Key considerations

- The largest and fastest growing dairy importers in the region are located in proximity to Armenia, creating an opportunity to boost exports of dairy products

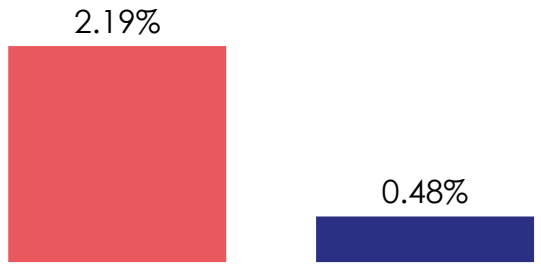
4. As demand for meat consumption slows down in developed economies, there is still growth in GCC and MENA countries

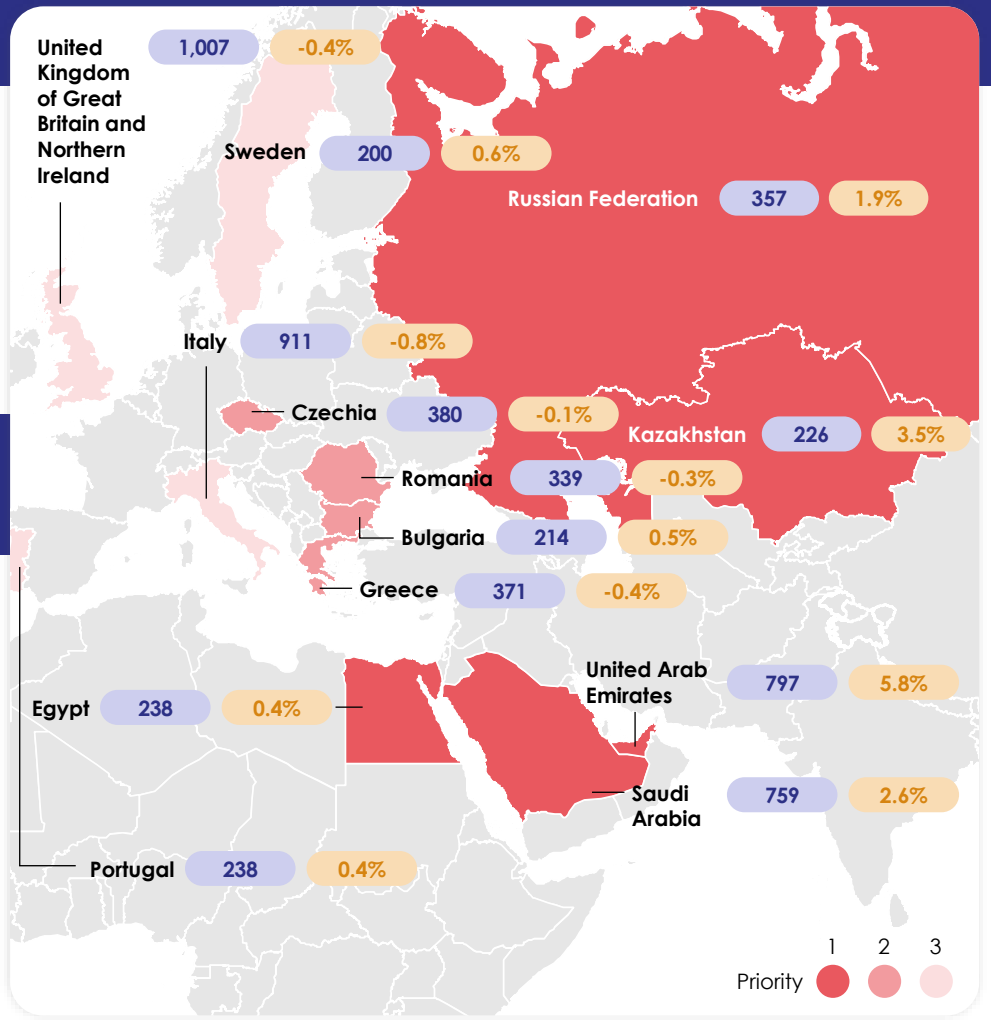
Developing economies | Developed economies | Target countries | xx Net imports 2019, thou tonnes | xx% 10-year CAGR, %

Growth of meat consumptions on average remains steady compared to dairy…

… but most of the growth is being driven by developing countries

Meat consumption CAGR '09–'19, %





Source: FAOSTAT

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Key considerations

- Demand for meat continues to grow steadily in developing countries
- The majority of economies surrounding Armenia show stable growth in demand for meat, suggesting opportunities for growth in the medium term

5. USA example – returns and margins have varied along the Ag and Food value chain, leading to significant integration and consolidation

ARMENIA 2021-2041 ideas in action

Companies have been integrated/ consolidated | Low | High

		Inputs: Seed & Chem	Inputs: Nutrition	Input distribution	Farming[2]	Aggregation	Branded consumer package goods	Retail
	Sample companies	Bayer CropScience, Monsanto, Dow[3], DuPont[3], FMC[3], Syngenta	Mosaic, CF Industries	PotashCorp, CHS[3], Viterra[4], Growmark		ADM, Bunge, CHS	Wild, Nestlé, ConAgra Foods, Kraft Heinz, Kellogg's, General Mills, PepsiCo	Walmart, Safeway, Whole Foods Market, amazon[4], Kroger, Costco Wholesale
Financial indicators	EBITDA[1], % (avg '06–'16)	~23%	~33%	~4%	~26%	~4%	~18%	~6%
	Capital intensity				N/A			
	ROIC[1], % (avg '06–'16)	22%	24%	7%	N/A	~9%	~34%	~15%
Consolidation level	Number of players	10s		100s	~3 mln	10s	1,000s	1,000s
	Est Top 5 share by segment, %	70–80%		50–60%	<1%	40–50%	15–25%	

1 Average financial performance for publically traded companies for 2006–2016
2 Used Net Farm Income and gross receipts data for analysis
3 Includes financials for only the relevant businesses in each segment
4 Financials not included in analyses

Source: CAP IQ, Team analysis

2041 vision for Armenia's agricultural sector: Food security within the country and trade value optimization

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2020 2031 2041

$1.5 → $2.4 → $3.5 bn

Target gross output of agricultural sector by 2041

2031 2041

233 → 91 thou required workforce

$0.5 → $2.4 bn export target

Food Security

100%

Self-sufficiency on critical crops and livestock products:

- Wheat
- Potatoes
- Fodder (maize, oats, barley)
- Poultry
- Pork

Export excellence

x5

Potential for agricultural export growth with a focus on the following products and trading partners:

- Fruits & vegetables
- Cigarettes
- Dairy products (milk, cheese)
- Wine
- Meat (cattle, pork, lamb)
- Spirits

To ensure full self-sustainability for Armenia, the agricultural sector will need to close the existing demand gap and cover consumption growth

ARMENIA 2021-2041 ideas in action

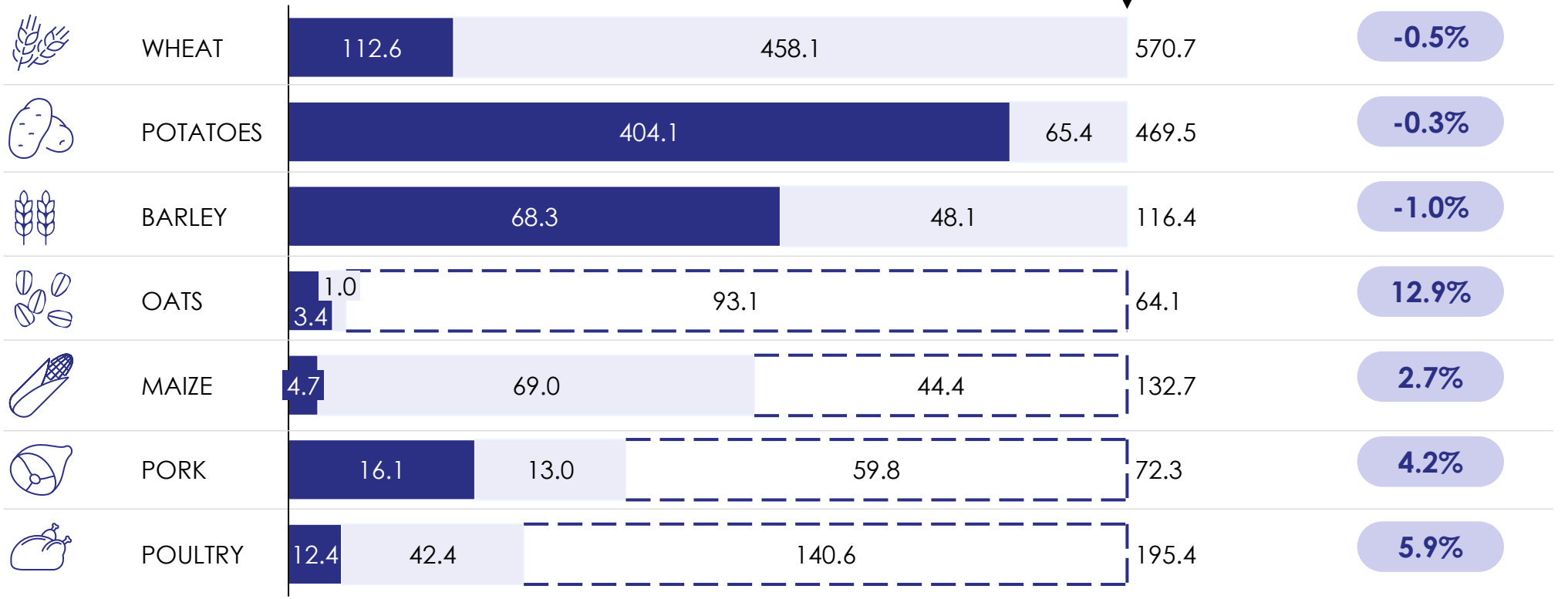
- Current output
- Existing demand gap
- forecasted consumption growth

47% → 100% Target self-sufficiency on key products for Armenia

233 → 91 thou required workforce

0.6 → 1.5 mln t target output

2041 output goals for critical crops, thou tonnes



Consumption CAGR '09–'19, %

WHEAT	-0.5%
POTATOES	-0.3%
BARLEY	-1.0%
OATS	12.9%
MAIZE	2.7%
PORK	4.2%
POULTRY	5.9%

Armenia has the potential to boost its exports 5 times by expanding its trade with major importers in the GCC and Eastern Europe

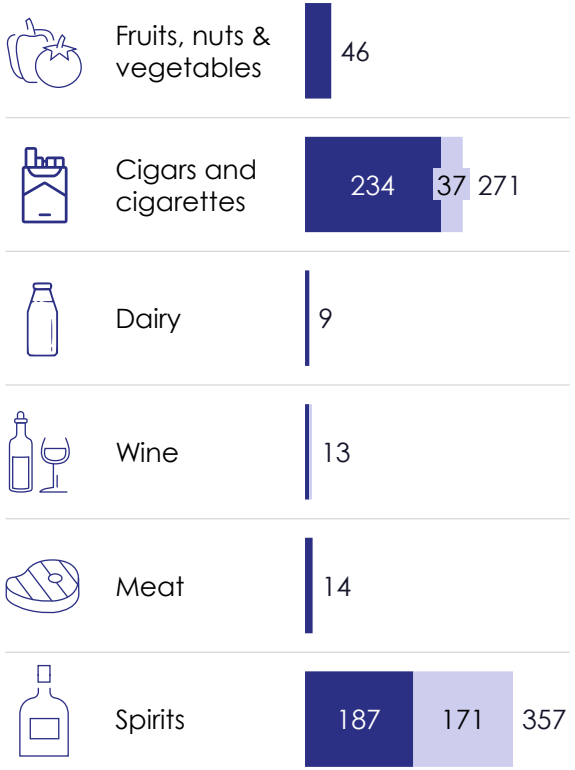
ARMENIA 2021-2041 ideas in action

- Current output
- Existing demand gap
- Forecasted consumption growth

$0.5 → $24 bn Target export volume

233 → 91 thou required workforce

Armenia's top export goods 2041, USD mln



Unrealized potential, USD mln	Growth potential by 2041, USD mln		Target trading partners	Key competitors
220	470	x11		
150	280	X2.5		
150	270	x40		
120	420	x50		
90	150	x11		
30	50	x2		

Key considerations

Its chernozem endowment and mild climate enable Armenia to reach export levels similar to Azerbaijan's and Iran's

Winning the competition with the UAE in Iraq is a critical driver for tobacco export growth

High quality combined with low recognition create an opportunity for growth assuming food safety standards can be upheld

While offering similar quality, Armenian wine seems underrepresented relative to Georgian

Development of meat processing standards and specialization in lamb could strengthen Armenia's position in the EMEA region

Growing recognition of Armenian brandy could enable substitution of strong spirits imported from Russia and Turkey

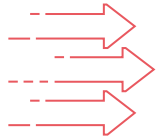
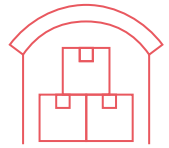
Table of contents – detailed vision by sector and by enabler

ARMENIA 2021-2041 ideas in action

Agriculture

Understanding how to grow the agricultural industries requires consideration of 5 enablers across the value chain

ARMENIA 2021-2041 ideas in action

Agriculture value chain	1 Input sourcing & production (seeds, chem, nutrition)	2 Input distribution	3 Farming	4 Processing	5 Aggregation & storage	6 Sales & export
						

Dimen-sions	People and talent	Infrastructure	Tech & Innovation	Ecosystem	Capital & investments
	Ensure the sufficiency, qualification and expertise of people employed in the agricultural sector	Enhance existing infrastructure (irrigation systems, machinery, roads and storage) to drive output in the agricultural sector	Leverage digital & analytics capabilities, biotech advances and cutting-edge hardware to improve agricultural productivity	Formalize the legal environment and expertise-sharing communities to support farming	Expand access to financing and resources for new venture establishment and development

NON-EXHAUSTIVE

ARMENIA 2021-2041 ideas in action

Enablers for agricultural development in Armenia

Less Critical ☐ ☐ ☐ Most Critical

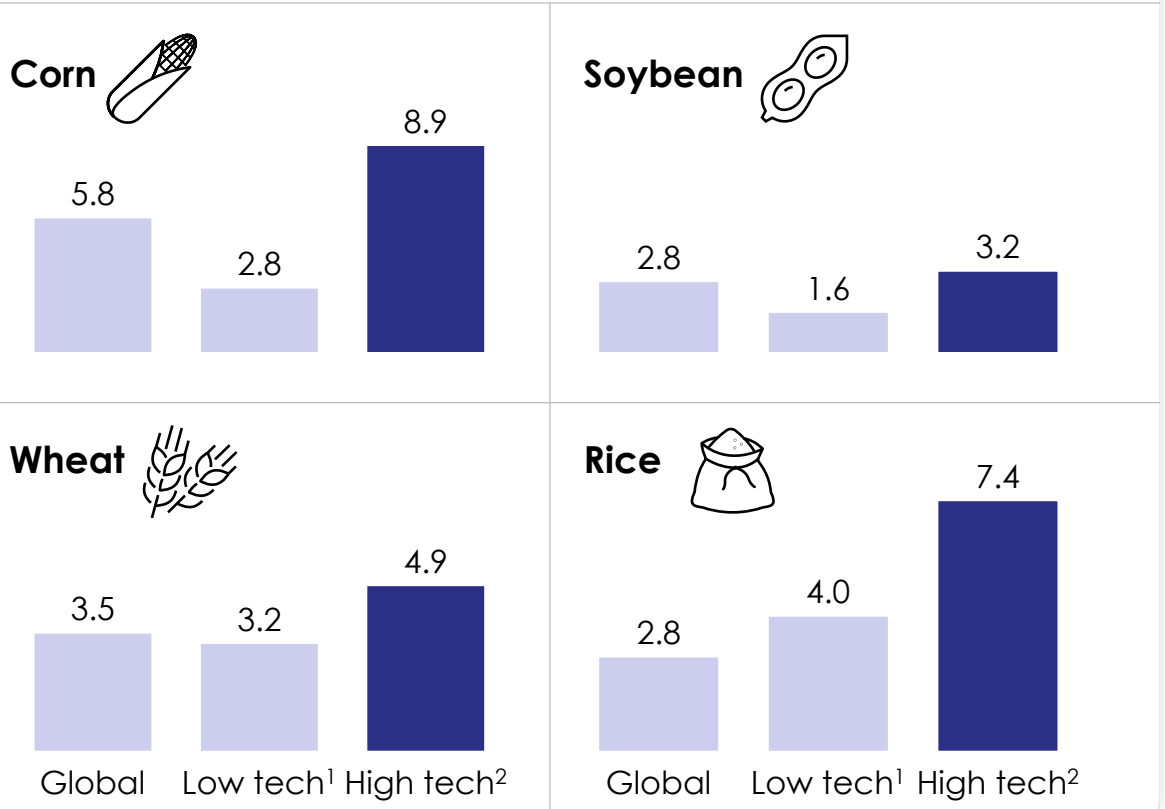
Dimensions	Input sourcing (seeds, chem, nutrition)	Input distribution	Farming	Processing	Aggregation & storage	Sales & export
1 People and talent	Expertise in chemistry, biotech and agtech to source the required inputs		Household & SME farming 2 **Labor force qualification** 3			
2 Infrastructure	**Easy access to imported or internally produced inputs** 1		Machinery **Drip irrigation systems** 5	Processing facilities	Cold storage Warehouses	Digital marketplaces to connect producers with PGCs and retailers
			Roads 4			
3 Tech & Innovation		Route optimization & tracking	**Digital tools, predictive analytics, advanced hardware (drones, sensors and robots)** 6			
4 Ecosystem			**Expertise sharing & agricultural accelerators** 7			
	Research labs and nurseries adjusting and modifying certified seeds & seedlings	Agricultural law (land and input use legislation), farming SME regulations				
5 Capital & investments	Investment in input R&D		**Access to financing for private household & SME farmers** 8 Land banks			

1. Utilization of advanced seeds and crop protection could significantly improve yields

ARMENIA 2021-2041 ideas in action

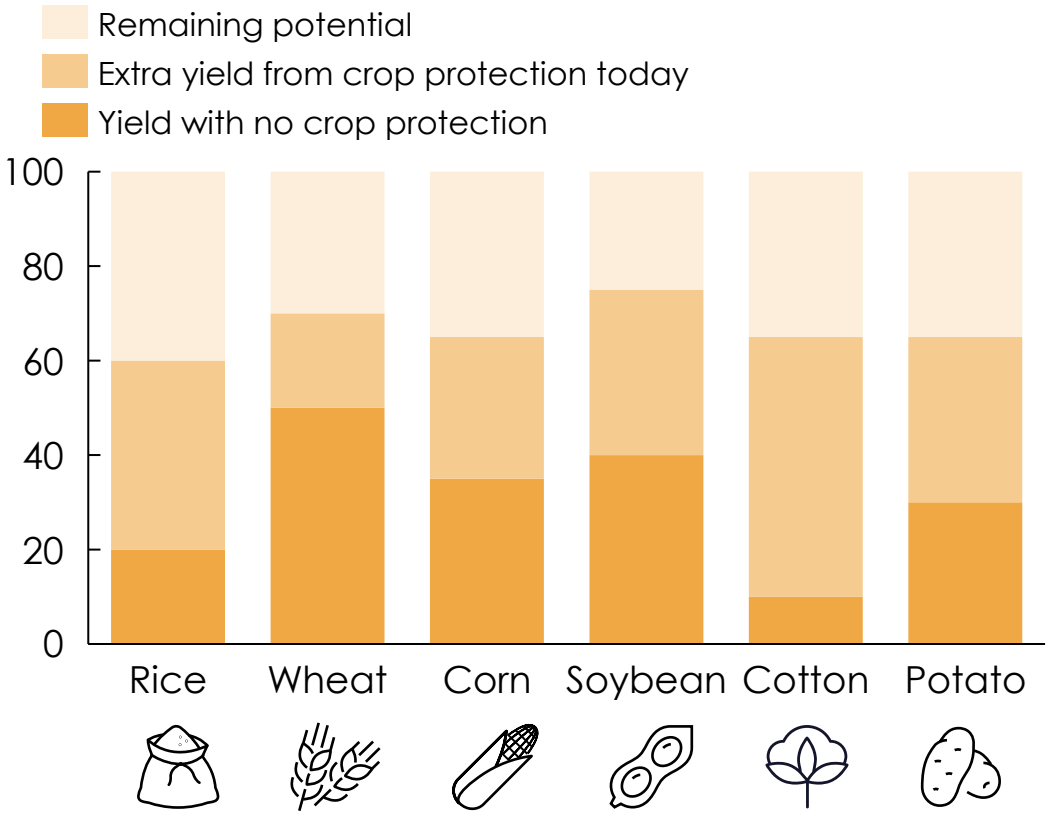
Yield correlates with the technification of agriculture (seed quality)

Core crops yields 2019, t/ha



Without crop protection, it is estimated that up to 40% of the world's food would not exist

Theoretical maximum yields for key crops

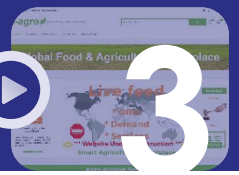


SOURCE: Syngenta presentation "Our industry 2016", FAOSTAT

1. Armenia falls behind peer countries in seed accessibility and fertilizers/crop protection application

1 **Household farmers and farming SMEs** primarily purchase inputs in **offline outlet stores**

2 **Large producers** purchase inputs **directly from manufacturers**



3 There are **no digital marketplaces** available to source inputs online

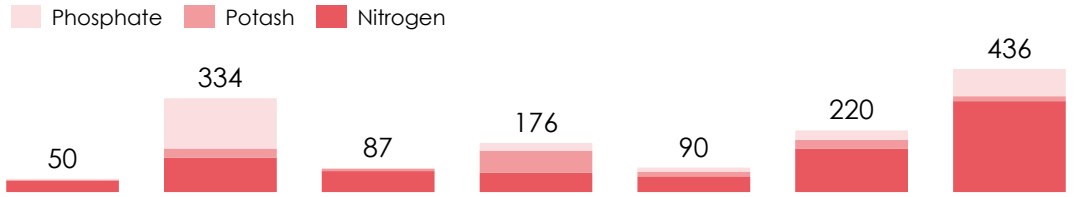
Seed availability in Armenia is limited, especially for small farmers

Availability

Saved	✓	✓	✓	✓
Certified	✗	✓	✓	✓
Gen. modified	✗	✗	✗	✗

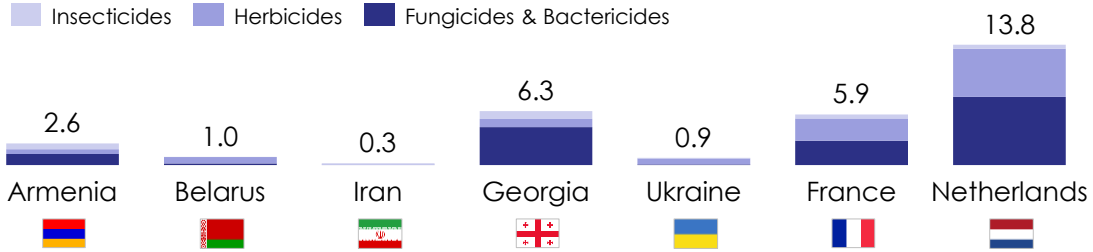
Fertilizer application in 2018, kg/ha

Availability



Crop protection application in 2018, kg/ha

Availability



Source: FAOSTAT, Expert interviews

Key considerations

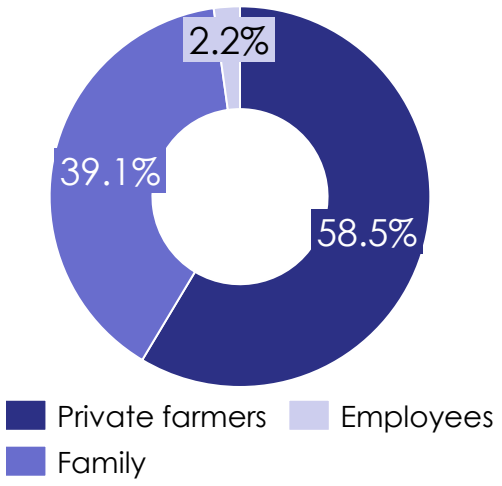
To enable wide accessibility of modern inputs it is essential to **invest in the creation of supply chains, nurseries** and easy access through **online marketplaces**

Low application of fertilizers and crop protection products could be overcome by **educating farmers on their benefits** and through **financing programs**

2. Armenia's agricultural industry is primarily driven by small farmers, but the headcount is excessive for the desired outputs

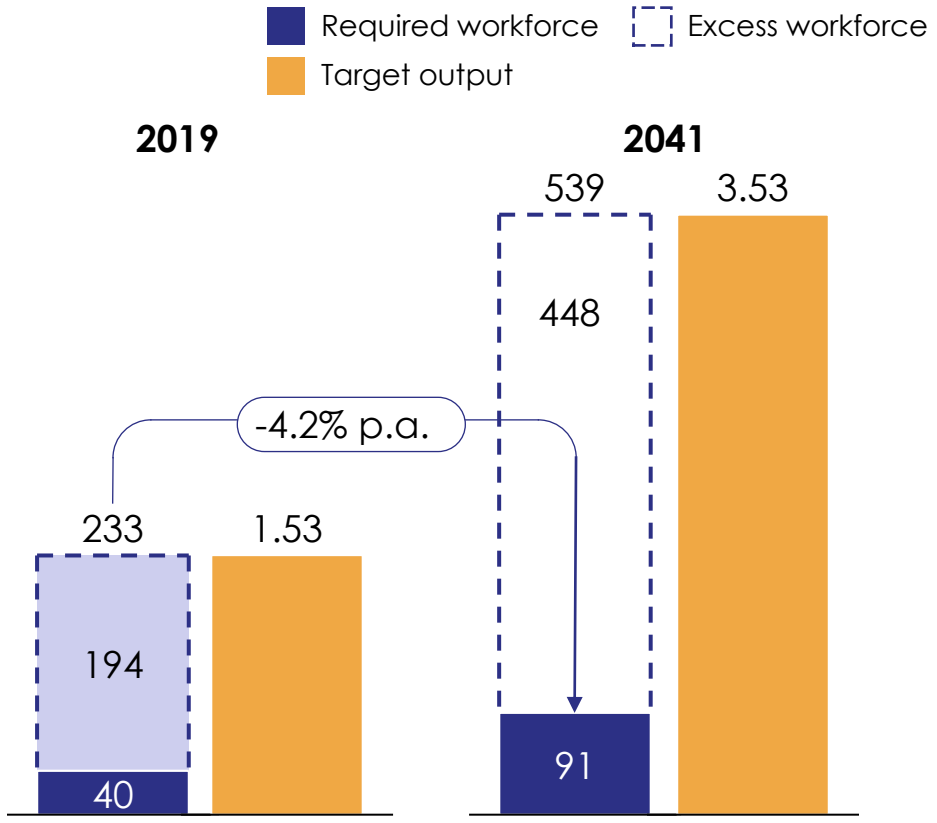
Prevalence of small farmers limits opportunities for economies of scale…

Structure of employment in Armenia in 2019, %



… yet productivity of labor can be greatly improved, enabling output growth while reducing human resources involved in farming

Headcount of employed in agricultural sector / Gross output value, thou ppl / USD mln



Key considerations

- Improvement of **labor productivity** should be **prioritized over headcount growth**
- Even with the limitations presented by the high level of fragmentation in the farming market, there is still **room to improve productivity by more than 4 times**
- As the economy develops it is expected that people will **move from farming** into more productive activities (e.g., agtech, services and other allied industries) as well as **other stages of the agricultural value chain** (collection, processing, distribution)

4. Development of road infrastructure could simplify and reduce the cost of transportation of produce for storage and export

Key indicator	Description	Comparison with peers
 Road connectivity	• A measure of average speed and straightness of a driving itinerary connecting the 10 largest cities that together account for at least 15% of the population • Reflects the accessibility of key hubs and production areas by car	**Road connectivity index** (100 – best) 59 77 85 97 89 78
 Quality of road infrastructure	• Response to the survey question "In your country, what is the quality (extensiveness and condition) of road infrastructure?" • Road quality affects ease of access and transportation costs for transferring produce between farms, processing centers and warehouses	**Quality of road infrastructure** (7 – best) 3.6 3.8 3.9 5.4 6.4 3.0
 Railroad density	• Density of railroads measured as kilometers or railroad per 1,000 km^2 of land area • Availability of railroads within the country affects the ease of transfer of grown, produced and packaged goods for storage in warehouses and onward export	**Railroad density** (km per 1,000 km^2) 24 19 6 53 89 37

Source: Source: World Economic Forum, Executive Opinion Survey (various editions)

Key considerations

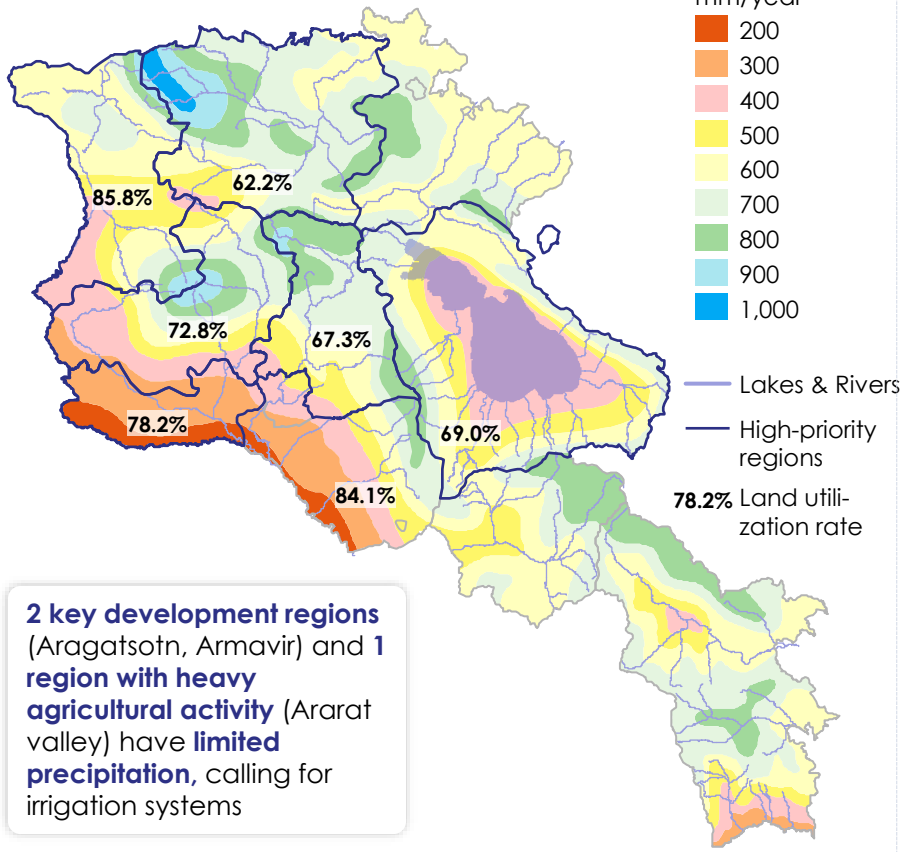
Armenia's lack of sea access and high air freight costs make roads and railroads priority logistical channels for international trade

The biggest impact from infrastructure interventions could be achieved by building/modernizing roads to key agricultural hubs and to the Georgian and Iranian borders (key trade partners)

5. Investment in irrigation systems is crucial for improving yields given Armenia's scarcity of natural precipitation

Armenia's key agricultural regions lack natural precipitation…

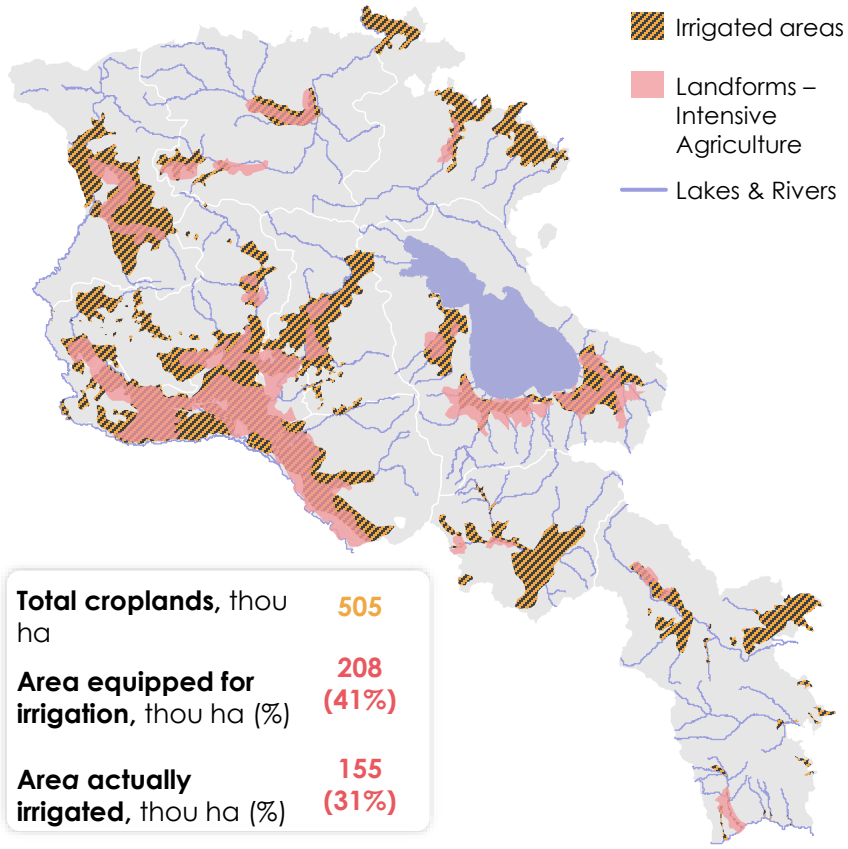
Precipitation map of Armenia, 2019



2 key development regions (Aragatsotn, Armavir) and **1 region with heavy agricultural activity** (Ararat valley) have **limited precipitation**, calling for irrigation systems

… while utilization of irrigation systems remains relatively low

Irrigation usage map of Armenia, 2019



Total croplands, thou ha	505
Area equipped for irrigation, thou ha (%)	208 (41%)
Area actually irrigated, thou ha (%)	155 (31%)

Source: FAOSTAT. USAID GeoCenter

Key considerations

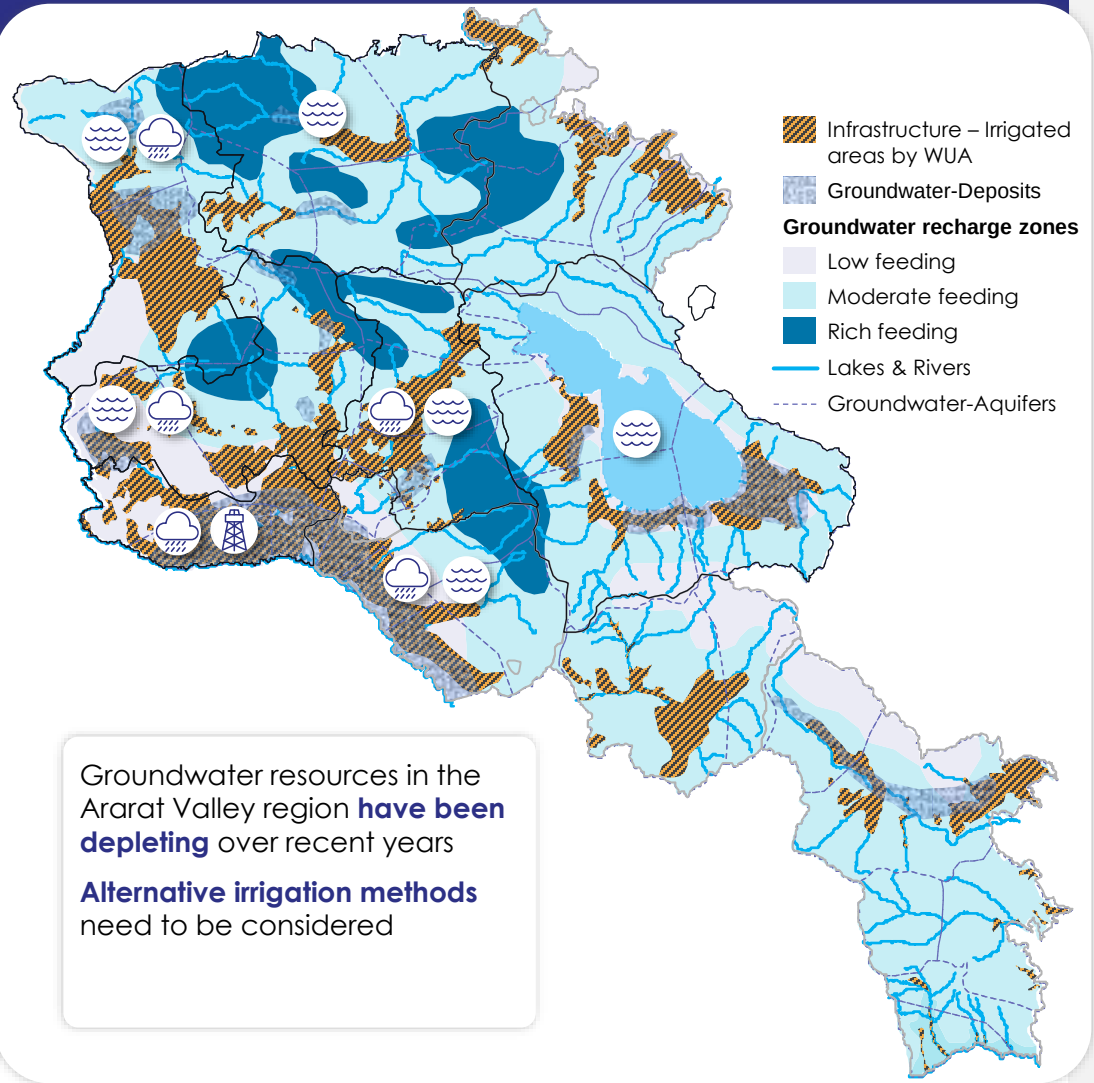
- A lack of irrigational practices make Armenia's agricultural output highly **dependent on precipitation**
- Establishment of **irrigation systems** should be prioritized for the low-precipitation areas of **Aragatsotn and Armavir**

5. Various interventions can be chosen for agricultural communities based on each region's agroecological conditions

Intervention	Criteria
Channels	Access to surface water
Rainwater harvesting & catchment dams	Poor access to groundwater deposits Poor access to surface water
Bore holes & shallow wells	Access to groundwater deposits of various depth Low access to surface water

Source: FAOSTAT. USAID GeoCenter

Priority irrigation interventions by region



Groundwater resources in the Ararat Valley region **have been depleting** over recent years

Alternative irrigation methods need to be considered

Key considerations

A combination of **rainwater collection** and surface water channels should be considered as an alternative for the **Ararat valley**

The target regions (**Aragatsotn, Armavir, Lori, Kotayq and Gegharkunik**) could prioritize building **irrigation channels** given easy access to surface waters

5. Leveraging technology could further improve irrigation efficiency, while both reducing irrigation costs and boosting yields (Barcelona example)

ARMENIA 2021-2041 ideas in action

Context

Barcelona needed to:

Reduce irrigation and water costs when building new parks and other green areas

Reduce the usage of scarce water resources

Optimize irrigation timing

Solution

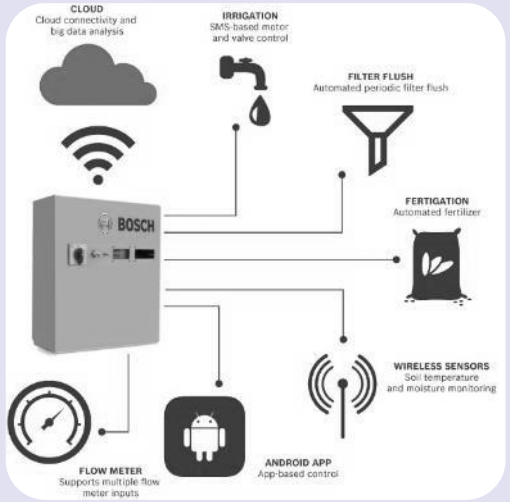
Barcelona has developed smart irrigation systems:

Soil moisture, temperature, weather etc. are monitored with sensors

The data are sent to a cloud service, analyzed automatically and visualized

Soil is automatically irrigated to the optimum moisture level, saving water based on weather + plant, seed and soil requirements

Smart irrigation systems connect through sensors and communicate via mobile



Barcelona smart irrigation system

Impact

USD 58 mln (up to 25% of the water bill) in OPEX savings per year just by saving water

More than a 25% reduction in water usage

Low maintenance costs and downtime, due to real-time incident detection by sensors

Better maintained plants and green areas due to real-time visibility of soil conditions and problems

SOURCE: Libelium, CISCO, FOX, Livongo

6. There are 10 priority use-cases relevant to agriculture in Armenia

Government-facing use-cases[1] Farmer-facing use-cases[1,2]

Outcome	Lever	Use-cases
Increase smallholder farmer incomes	Access to inputs	**Target eligible farmers with e-subsidies for inputs and mechanization based on a farmer registry**, using digital tools and analytics to improve subsidy performance (e.g., track yield improvements)
	Access to knowledge	**Improve farmer practices (e.g., input use) by providing farmers with customized e-extension advice** that incorporates current and predictive data (e.g., weather) on an easily searchable platform
	Access to markets	**Provide farmers with regular crop market prices** from geo-located markets nearby, to reduce market information asymmetries
Increase agri-cultural output	Domestic production	**Improve value chain selection for optimal land use** with a resource optimization model tailored to specific outcomes (e.g., GDP contribution, job creation)
Improve food and nutrition security	Availability for households	**Manage the national food deficit** by monitoring countrywide food production and consumption through a digital Food Balance Sheet (FBS)
	Quality of food	**Increase the efficiency of storage facilities** through a warehouse receipt system and optimization analytics
	Climate and environmental risks	**Reduce crop losses with an early warning system for weather fluctuations**, to help farmers adjust planting and harvest plans
		Reduce crop losses with an early warning system for pest and disease outbreaks, and advise on actions to protect crops
Enablers		**Build a digital farmer registry** with regularly updated farmer profiles incl. farm location, farm size and crop(s) grown to inform all the farmer-facing use-cases
		Create transparency and improve baseline for agricultural statistics with a joint-access national agriculture data platform

SOURCE: Expert interviews and team analysis

6. E-subsidy use-case (Nigerian example)

Government spend on subsidies fell by 9% over 3 years after the introduction of an e-subsidy program

Context

Agriculture employs **26 mln Nigerians** (~10%), and accounts for 20% of GDP

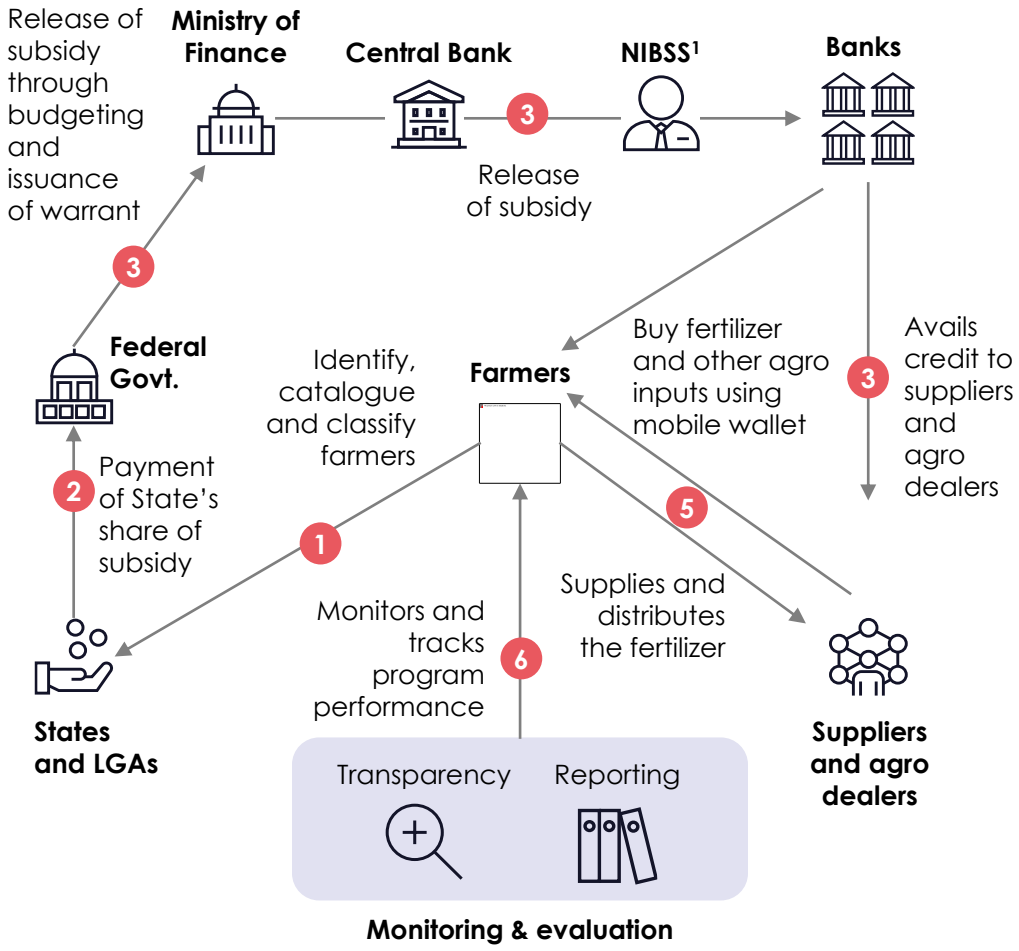
Fertilizer supply consumed >50% of federal government capital, but use by farmers was low

In 2011, government in partnership with Cellulant **launched a new fertilizer distribution scheme using an e-wallet system** under the Growth Enhancement Support Scheme (GESS)

GESS is a digital identification system that **ensures direct delivery of subsidized farm inputs** to farmers

Farmers can redeem agricultural inputs from agro-dealers **at half the cost**, the other half is paid by the government

Approach



Impact

~14.5 mln
farmers successfully registered by 2017

>30%
of surveyed participants reported an improvement in time to access fertilizers during farming period, and cheaper price per bag

>9%
Reduction in the cost of the subsidy program (per MT) over 3 years[2]

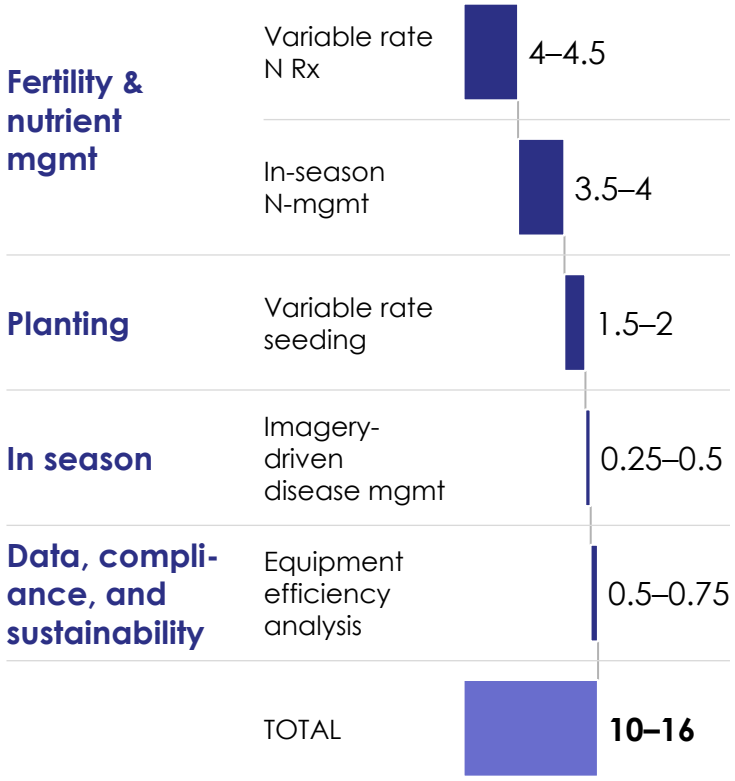
90%
of targeted farmers reached, vs. 11% in non-digital program

1.Nigeria Inter-Bank settlement system
2.Between 2011 and 2014

SOURCE: Press search; NAPREJ 2017; CSEA

6. Leading digital tools have the potential to create USD 10 bn+ in value for farmers and ecosystem players (U.S. corn market example)

Potential value creation from leading digital agronomy tools in US corn



Composition of per-acre potential value

Yield impact	12–14 bu/ac	×	USD 3.70/bu	
Yield impact	10–12 bu/ac	×	USD 3.70/bu	
Yield uplift	4–6 bu/ac	×	USD 3.70/bu	
Reduced losses from disease	20%	×	10–15% loss	× 185 bu/ac
Reduced frequency of machinery repairs	15–25%	×	USD 32.75/ac	

High value uplift potential from incremental digital use-cases, e.g.

- Variable rate agchem Rx and weather monitoring for optimal pest mgmt.
- Water and energy cost savings from data-driven irrigation mgmt.
- Predictive analytics and software platforms for precise yield modeling

Distributed uniformly **acro all US row crop acreage** – of which corn comprises

~28%

total value creation could approach

>USD 35 bn

for leading digital agronomy tools which have tangible value and notable adoption today

Source: Company Websites, NutrientStar, USDA, Cornell University

6. Land optimization use-case (African example)

We improved land resource allocation with digital tools to grow agriculture sector output by an estimated 4% CAGR

Context

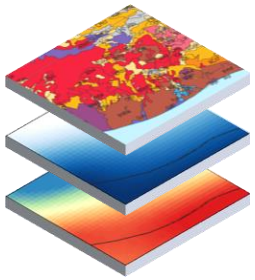
The Ministry of Agriculture of an African country was faced with a **struggling agriculture sector after an extensive conflict** and investment in low-revenue crops led to:

- **Much lower yield** than in comparable countries (within region and globally)
- **Much lower percentage of total arable land** being used to grow crops

Agriculture was declared a priority sector for investment in the 2050 national economic development plan.

Approach

1. Divided country into **5 different regions** based on environmental conditions
2. Created **list of most suitable crops** for each region's conditions
3. Researched **economic potential** of suitable crops and shortlisted highest potential crops
4. Determined **regional crop allocation** based on revenue/ hectare, current land allocation, international benchmark and market structure
5. Calculated expected **economic impact,** taking into account current arable land, potential arable land expansion, and yield increase



Soil variables

Precipitation

Temperature

Highly suitable

Moderately suitable

Poorly suitable

Unsuitable

Impact

~4%

estimated CAGR to grow agricultural output 4x from USD 8 bn to USD 32 bn by 2050

18

crops identified for investment in 5 regions

>75%

of value from 8 key crops for priority investments

7. Agricultural accelerators serve as an institution of diversified support for farmers and agricultural SMEs, helping them to increase productivity

ARMENIA 2021-2041 ideas in action

Scope		Description
Diagnose SME business needs		• Conduct a diagnostic on each selected beneficiary's challenges and opportunities, which will inform a business plan and support plan to guide the project and report progress
Provide direct support to SMEs	**Business training and services**	• Training in financial management skills, marketing skills, branding and sales management, tax compliance, etc. • Advisory on navigating regulatory requirements, policies, standards, and compliances • Mentorship and coaching by specialized partners along the value chain • Mediatory role between private sector partners and SMEs to ensure that trade and distribution of inputs is conducted in the best interest of the farmers
	Technology	• Access to agribusiness based information and technology • Training in technology and digital innovation
	Networks	• Access to agribusiness entrepreneur networks, competitions, and fairs
	Aggregation for scale	• Aggregating farmers to increase and monitor production and supply • Aggregating agro-dealers to increase bandwidth to access inputs, supplies, markets, etc.
Facilitate private partnerships	**Access to financing**	• Linkages with partner financial institutions (e.g., banks, insurance companies), development partners, NGOs, government, etc. for short- to medium-term funding
	Market linkages	• Access to value chain business partners and specific market information and knowledge, including market linkages backward and forward along the value chain, etc.
Disburse small grants		• Identify and select grant beneficiary SMEs and disburse grants as per the grant criteria

1 SME challenges being addressed on page previous page

7. Example: An acceleration program in Africa enabled market access for ~1mln small-scale farmers in high-productivity zones by accelerating ~1,000 farmer-facing SMEs

ARMENIA 2021-2041 ideas in action

Flagship overview

Brief description

Overview

- **Target ~1 mln farmers in ~40 high-productivity zones (initially) served by ~1,000 farmer-facing SMEs:**

A **SMEs will include ~25–30 agro-centers and equipment distributors, ~600–750 agro-dealers, ~20–25 processors, and ~120–150 cold storage chains / providers,** which will be selected through a competitive process to receive business support and linkage to government programs and targeted private partners

B **Farmer associations,** driven by demand through private sector linkages, such as contract farming

Stake-holders

- **High-potential SMEs** with expansion plans **apply for support**
- Business accelerators provide **business training and access to finance to selected SMEs and farmer-based organizations**
- **Private partners** provide markets, services, and products to high-potential SMEs
- **Lenders (and guarantors)** provide affordable products, supported by performance data collected by accelerators on SMEs

Risks to manage

- **Inadequate quality of business training** support would quickly cause the program to lose credibility
- **Market shocks** (e.g., owing to global commodity prices) and the **complex regulatory environment** could **undermine the profitability of SMEs,** leading to credit defaults

1 56% surface via pumps, weirs and springs (mostly Western, Rift), 24% ground and 20% harvested via small dams and water pans (mostly ASALs, Central, Semi-arid uplands)

SOURCE: Team Analysis

Focus Areas

Value chain & regions

- **Value chain:** Fish, Cereal, Horticulture, Tubers, Dairy
- **Locations:** High-productivity zones in 36 counties across Western, Rift Valley, Central Highlands, Semi-arid uplands

2024 value at stake

- **SMEs served**: ~1,000
- **Farmers impacted:** ~1 mln
- **Income increase:** KES ~20,000 per farmer per annum
- Increase in agricultural GDP in year five: ~KES 15 bn

7. Example: Prioritized program interventions for agro-processors

Challenge	Accelerator role	Example potential partners
Access to financial services	• **Identify and shortlist ~25 stand-out processors** to benefit from financing • **Link SMEs with partner financial solutions** for tailored short- to medium-term funding, including trade financing, asset finance, hire purchase, equity funding, debt	• **Guarantors:** AGRA, MCF, IFC, IFAD • **Loan products:** KCB, Equity, Family Bank, AFC, Rafiki Microfinance • **Equity financing:** Manufacturing Africa, Kenya Catalytics Jobs Fund • **Insurers:** APA, Jubilee, Oriental, CIC, ICEA
Access to raw materials	• Help processors implement **quality farming standards and processes** • Support processors set up outgrower networks • Co-design solutions to scale up raw materials supply e.g.,. **Farmer incentive program for high-quality output** • **Offer logistics solutions,** e.g., coordinate leased / rented trucks to support processors in bundled transportation of raw materials without necessarily putting in capital or owning the risk • Connect processors to **farmer-based organizations** that meet the quality standards and quantities required • **Co-design outgrower and supply aggregation solutions** (farmer identification, creation of farmer groups, price incentives, aggregation logistics, etc.) with processors	• **Farmer groups:** Cooperatives, trade unions
Product competitiveness	• **Help processors to meet and achieve product quality standards, including** KEBS, export standards, product safety, packaging, etc.	• Equipment suppliers
Access to markets	• **Offer pooled support for package of branding services**, e.g., web and graphic designers, packaging, etc. • **Offer training** in building brand equity, marketing (sales and promotional services) • **Link processors to offtakers and logistics partners** e.g., grocers; Support aggregation of micro-retailers for bundled delivery of consumer processed goods	• **Offtake:** Twiga Foods, Copia, SokoWatch, Cargill, EABL, ETG, Naivas, Carrefour • **Agriculture marketing boards:** KTDA, HCDA, EPK
Business management and network	• Conduct SME **business assessment prior** to program launch to identify key business issues/challenges and **develop a bespoke accelerator delivery plan for selected SMEs** • **Co-develop business plans and growth strategy** • **Offer support on how to manage importation of machinery**, equipment, etc.) into Kenya in line with government guidelines • **Offer business training and services** to equip processors with basic business operational skills, including management, data analytics, record keeping, business planning, etc.	• **Technology providers:** Safaricom, Vera Solutions, Shamba records, Apollo Agriculture • **Networks:** KAAA, ASNET, Farm to Market Alliance (FTMA) • **Others:** Udemy, Technoserve

8. Development of private farming could be boosted through the creation of a digital agricultural ecosystem in collaboration with banks (example of African country)

ARMENIA 2021-2041 ideas in action

Context

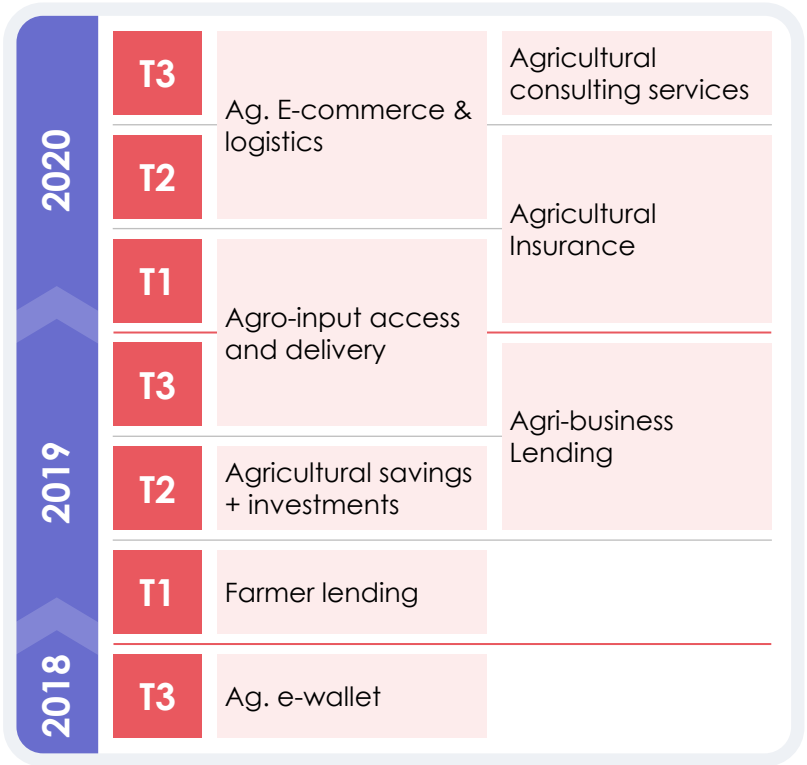
It is estimated that **over 80%** of the country's **population** is involved in **agricultural activities**

The majority of these farmers are **registered on a national database** through which they are able to access agro-related services, such as subsidies on agro-inputs and extension services

An opportunity for the Bank to **play** in the **digital agriculture ecosystem** by **building on its existing database and platform**

Approach

8 agricultural data use-cases were identified and a **digital strategic roadmap** was drawn up to deliver on them



Impact

In 3 months, an agricultural digital platform with **2 products was made available to** farmers

- **USSD mobile wallet** for private farmers and SMEs
- **Apps** used **by agro-dealers** for **ordering** and **stock management**, for 3 customer segments that are integrated into the national farmer registration database

Precision Ag technology: Precision irrigation

Description

Precision irrigation systems involve scheduling and implementation systems ranging from sensor driven drip irrigation to mechanical linear/center-pivot to maximize the area irrigated, reduce wastage, and optimize cost/ profitability. The solution and investment varies depending on primary objectives and various agronomic factors impacting the field

Major factors

Pre-Reqs

- **Type of irrigation systems:** Sprinkler, surface Drip, subsurface drip
- **Connectivity:** Soil sensors for measuring soil moisture/ conductivity for scheduling

Optimal usage scenario

- **Weather:** Surface water availability at the right time of the year
- **Farm topography/ soil type:** Managing nitrogen run-off in elevated sandy soil
- **Crop/ genetics:** Drought resistant traits

Top players

- **Lindsay Corp**

Quantified benefits

Yield gains

- **~30 bushel per acre for corn** vs. non-precision irrigated

Cost reduction

- **~25% reduction in energy costs** due to scheduling and running sprinklers/pumps optimally

Sustainability gains

- Reduction in nitrogen run-offs
- Improve water productivity and reduce wastage due to clogging

SOURCE: Web search, USDA ERS

Next generation agriculture technology: Drones

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Description

Drones or UAVs are typically equipped with cameras to enable live monitoring of the field, enabling the farmer to make analytically driven decisions. The farmer uses drones for delivery, e.g., crop dusting and seeding. Drones typically have multispectral, infrared, thermal cameras to inform farmers of: yield forecasts, fertilizer management, irrigation, and crop health assessments. In addition, drones can spray crops and plant seeds, some drones can plant up to 800 seeds per hour

Major factors

Pre-requisites

- **Data analytics:** need to translate data into insights and actions
- **Regulations:** Drones require government approval to fly commercial UAVs
- **GPS:** Needed to guide the drones

Optimal usage scenario

- **Variable rate technology:** The analytics coming from a drone provide farmers with the insights needed to offer customized seeding, CP, and CN rates to specific parts of the farm
- **Large Farms:** Drones allow farmers t monitor large swaths of land without going into the farm

Top players

- **Drone seed, Agribotix, AG Eagle, Mavrx**

Quantified benefits

Yield gains

- **Unknown:** Drone technology would supplement existing VR technology and enable farmers to make better decisions

Cost reduction

- **Labor Costs:** Drones could conduct seeding, CP and CN application in the future, thereby reducing labor needs

Sustainability gains

- **Reduced CP and CN application**: due to precision application
- **Reduce compaction:** potentially replaces the tractor in some field applications

SOURCE: Team analysis

Cold chain storage facilities: Prioritized program interventions

Challenge	Accelerator role	Example potential partners
Access to financial services	• **Identify and shortlist ~150 stand-out cold chains** to benefit from financing • **Link cold chains with partner financial institutions** and funds for short- to medium-term funding – Asset finance, Hire Purchase, Equity funding, debt, etc. • Support cold chains to **fulfil loan application requirements**	• **Guarantors:** AGRA, MCF, IFC, IFAD • **Loan products:** KCB, Equity, Family Bank, AFC, Rafiki Microfinance • **Equity financing:** Manufacturing Africa, Kenya Catalytics Jobs Fund • **Insurers:** APA, Jubilee, Oriental, CIC, ICEA
Access to raw materials / customers	• Offer training in **quality assurance, especially in dairy** • Coordinate **leased / rented storage trucks to support SMEs in bundled cold transportation of raw materials** without necessarily putting in capital or owning the risk • Coordinate **location-based farmer aggregation** to scale up raw material supply e.g., milk • Support SMEs set pricing for storage services	• **Farmer groups:** Cooperatives, trade unions
Marketing (offtaker facing)	• **Offer pooled support for package of branding services**, e.g., web and graphic designers, packaging, etc. • **Offer training** in building brand equity, marketing (sales and promotional services) • **Help SMEs link to offtakers and logistics partners** and sign / negotiate offtake contracts	• **Offtake:** Twiga Foods, Copia, SokoWatch, Cargill, EABL, ETG, Naivas, Carrefour • **Agriculture marketing boards:** KTDA, HCDA, EPK • **Brand agencies: TBC**
Business management and network	• **Co-develop business plans and growth strategy** • **Offer business training and services** to equip cold chains with basic business operational skills, including management, data analytics, record keeping, business planning, etc. • **Offer training in product quality standards** in line with KEBS guidelines and requirements	• **Technology providers:** Safaricom • **Networks:** KAAA, ASNET, Farm to Market Alliance (FTMA), MSEA • **Others:** Udemy, Technoserve
Navigating new business opportuni-ties	• Link cold chains to **storage technology providers** • Share information on **latest technologies and business ideas** e.g., solar-powered cold storage solutions	• **Technology provider:** Freshbox, Solar Freeze, Cold Solutions East Africa, InspiraFarms East Africa • **Cold storage tech provider:** EcoZen

Ag-centers and Agro-dealers: Prioritized program interventions

Challenge	Accelerator role	Example potential partners
Access to financial services	• **Identify and shortlist stand-out Ag-centers and Agro-dealers** to benefit from financing • **Link Ag-centers and Agro-dealers with partner financial institutions and funds** for short- to medium-term funding – Input finance, Debt, Asset finance, Equity funding, Forward input contracts, etc. • Support SMEs to **fulfil loan application requirements**	• **Guarantors:** AGRA, MCF, IFC, IFAD • **Loan products:** KCB, Equity, Family Bank, AFC, Rafiki Microfinance • **Equity financing:** Manufacturing Africa, Kenya Catalytics Jobs Fund • **Insurers:** APA, Jubilee, Oriental, CIC, ICEA
Access to inputs / supplies	• **Coordinate aggregation of Ag-centers and Agro-dealers** to negotiate for better supply terms from input suppliers (supply of inputs / inventory on credit) and distributors • Offer support on how to **manage importation of inputs such as fertilizer, pesticides** into Kenya in line with government guidelines	• **Farmer groups:** Cooperatives, trade unions • **Input providers:** Bayer, Yara, MEA, KALRO, Kenya Seed Company, Agri SeedCo, UPL, Osho, Twiga Chemicals, Norbrook, Coopers Ltd
Marketing	• **Offer training to Ag-centers** on sales and marketing • **Support marketing activities** – coaching and linking Ag-centers and Agro-dealers with farmer groups and associations, working with county extension officers to increase farmer education on available inputs, etc. • **Train in in-store sensitization of farmers** on product quality verification / validation	• **Agriculture marketing boards:** KTDA, HCDA, EPK • **Input providers:** Syngenta, Bayer, Yara, MEA, Kenya Seed Company, Agri SeedCo, Osho, Twiga Chemicals, Norbrook, Coopers Ltd
Business manage-ment and network	• **Co-develop business plans and growth strategy** • **Offer business training and services** to equip Ag-centers and Agro-dealers with basic business operational skills, including management, data analytics, record keeping, business planning, etc. • **Coach and mentor Ag-centers and Agro-dealers** including connection with agrobusiness entrepreneur networks	• **Technology providers:** Safaricom, **Networks:** KAAA, ASNET, Farm to Market Alliance (FTMA), MSEA • **Others:** Udemy, Technoserve
Navigating new business opportuni-ties	• Link SMEs with **new business opportunities** e.g., Pula crop insurance	• **Insurers:** APA, Jubilee, Oriental, CIC, ICEA • **Soar suppliers:** EcoZen

NOT EXHAUSTIVE

A collaborative approach is needed to address the challenges facing agro-processors

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Challenge	Accelerator role		Example potential partners
Access to finance services	• **Identify and shortlist ~25 stand-out processors** to benefit from financing • **Link SMEs with partner financial solutions** for tailored short- to medium-term funding– including trade financing, asset finance, Hire Purchase, Equity funding, debt	• Enlist **financial partners** to support the most relevant existing SME fund(s) – [MoALFC – ATO]) • Ensure **selected SME fund(s)** have appropriate eligibility criteria and efficient approval/disbursement processes – [MoALFC – ATO]) • Collaborate with **development partners to provide financial guarantees** on loans to processors – [MoALFC – ATO]) • Help implementing partners **access information on funding opportunities** – [MoALFC – ATO])	• **Guarantors:** AGRA, MCF, IFC, IFAD • **Loan products**: KCB, Equity, Family Bank, AFC, Rafiki Microfinance • **Equity financing:** Manufacturing Africa, Kenya Catalytics Jobs Fund • **Insurers:** APA, Jubilee, Oriental, CIC, ICEA
Access to raw materials	• Help processors implement **quality farming standards and processes** • Support processors set up outgrower networks • Co-design solutions to scale up raw materials supply e.g.,. **Farmer incentive program on high-quality output** • **Offer logistics solutions**, e.g., coordinate leased / rented trucks to support processors in bundled transportation of raw materials without necessarily putting in capital or owning the risk • Connect processors to **farmer-based organizations** that meet the quality standards and quantities required • **Co-design outgrower and supply aggregation solutions** (farmer identification, creation of farmer groups, price incentives, aggregation logistics, etc.) with processors	• Connect processors to **farmer-based organizations that meet the quality standards and quantities required** – [Counties – Extension Officers] • Support **setup of outgrower networks or farmer cooperatives** [Counties – Extension Officers] • Coordinate **farmer aggregation** along value chains – [Counties – Extension Officers]	• **Farmer groups:** Cooperatives, trade unions
Product competitiveness	• **Help processors to meet and achieve product quality standards, including** KEBS, export standards, product safety, packaging, etc.		Equipment suppliers
Access to markets	• **Offer pooled support for a package of branding services**, e.g., web and graphic designers, packaging, etc. • **Offer training** in building brand equity, marketing (sales and promotional services) • **Link processors to offtakers and logistics partners** e.g., grocers; support aggregation of micro-retailers for bundled delivery of consumer processed goods	• Offer **dedicated support (policy review, direct referrals and linkages) of state marketing boards** e.g., KTDA, Coffee Board of Kenya, Horticulture Crops Development Authority (HCDA) – [MoALFC – ATO, MoITED]	• **Offtake:** Twiga Foods, Copia, SokoWatch, Cargill, EABL, ETG, Naivas, Carrefour • **Agriculture marketing boards:** KTDA, HCDA, EPK
Business management and network	• Conduct SME **business assessment prior** to program launch to identify key business issues/challenges and **develop a bespoke accelerator delivery plan for selected SMEs** • **Co-develop business plans and growth strategy** • **Offer support on how to manage importation of machinery**, equipment, etc.) into Kenya in line with government guidelines • **Offer business training and services** to equip processors with basic business operational skills, including management, data analytics, record keeping, business planning, etc.	• Connect SMEs to **relevant government counterparts and programs** e.g., KALRO, MSEA, YEDF, Agriculture and Food Authority (AFA) – [MoALFC – ATO]) • Facilitate **business registration / licensing** – [Registrar of Companies, MSEA, Counties]	• **Technology providers:** Safaricom, Vera Solutions, Shamba records, Apollo Agriculture • **Networks:** KAAA, ASNET, Farm to Market Alliance (FTMA) • **Others:** Udemy, Technoserve

Six strategic moves in agriculture for Armenia to consider

ARMENIA 2021-2041 ideas in action

Prioritized initiatives

- **Recultivate fallow land** – expand land utilization through consolidation incentives to boost production
- **Focus on production of critical produce** – ensure self-sufficiency and food security (e.g., in cereals, fodder, animal protein)
- **Expand Armenian exports** – target exports of fruits, tobacco and wine products to target countries (e.g., Russia, Ukraine, UAE, Saudi Arabia)

Sector-specific enablers

- **Leverage advanced seeds, agtech** – e.g., use bacterial inoculants to fix nitrogen and boost farming productivity
- **Develop agricultural hubs** – educate and support farmers on modern agricultural techniques (e.g., cover crops), industrialization and commercialization of production
- **Develop country-wide irrigation systems** – use modern technologies (e.g., drip irrigation) to improve productivity of water usage