CSIR COLLEGE OF SCIENCE AND TECHNOLOGY

Innovative Solutions for sustainable crop production in Ghana

Leveraging Technology and IP Tools to Overcome Farming Challenges

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24th April 2023

OUTLINE

- Agriculture in Ghana.
- Constraints in crop production Ghana.
- Innovative solutions for sustainable crop production in Ghana.
- How to motivate Individuals to adopt innovative solutions.

Agriculture in Ghana

Agriculture employs about 60% of the country's workforce.

Vital for food security & nutrition security in Ghana.

The sector accounts for about 20% of the country's GDP.

Agriculture in Ghana provides a range of raw materials for various industries.

The sector provides income-generating opportunities for rural development.

Figure1: **Map of Ghana**

Constraints in crop production Ghana

Climate change leading to pest infestations

Figure 2: **Infestation of fall armyworm**

Figure 3: **Infestation of tomato bug**

Constraints in crop production in Ghana

Drought and decline in soil fertility in Ghana

Figure 4: **Drought and decline in soil fertility in Ghana**

Constraints in crop production in Ghana

Insufficient post-harvest management resulting in food losses of up to 45.6%.

Figure 5: **Poor postharvest handling in Ghana**

Constraints in crop production in Ghana

Inefficient marketing system and price fluctuation

Figure 6: Food commodity **market in Ghana**

Constraints in crop production in Ghana

Other constraints

- ✓
- ✓ Use of unimproved crop varieties./landraces
- ✓ Use of unimproved technologies.
- ✓ Lack of labour for planting and weeding.
- ✓ Challenges with access to credit.

Innovative Solutions for sustainable crop production in Ghana

Improved Crop varieties

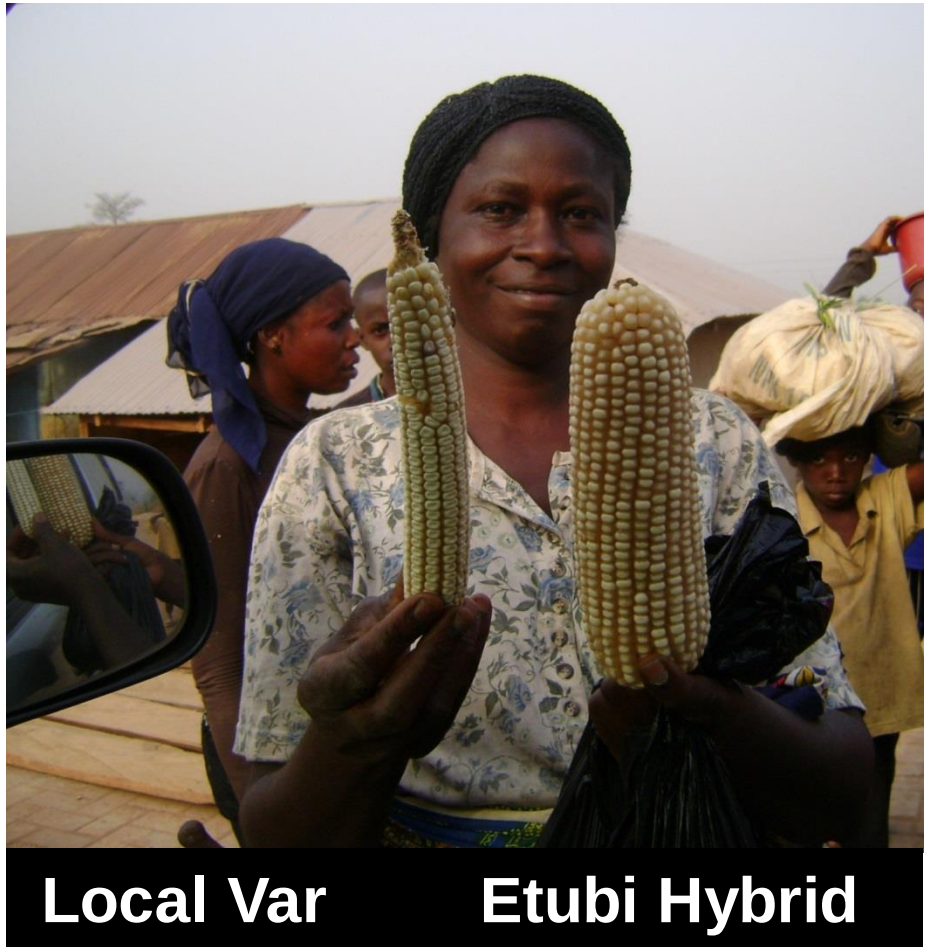


Figure 7: **CSIR-CRI developed a high- yielding drought-tolerant maize variety**

Figure 8: **Groundnut variety susceptible to rosette virus**

Figure 9: **Resistant groundnut variety**

Source: CSIR-CRI

Improved Crop varieties

Figure 10: **Rice susceptible to flooding**

Figure 11: **Rice resistant to flooding**

Source: CSIR-CRI

Climate-smart villages

Figure 12: **An interplay between agroforestry, conservation agriculture and circular economy**
Source: **Kongoussi in Burkina Faso**

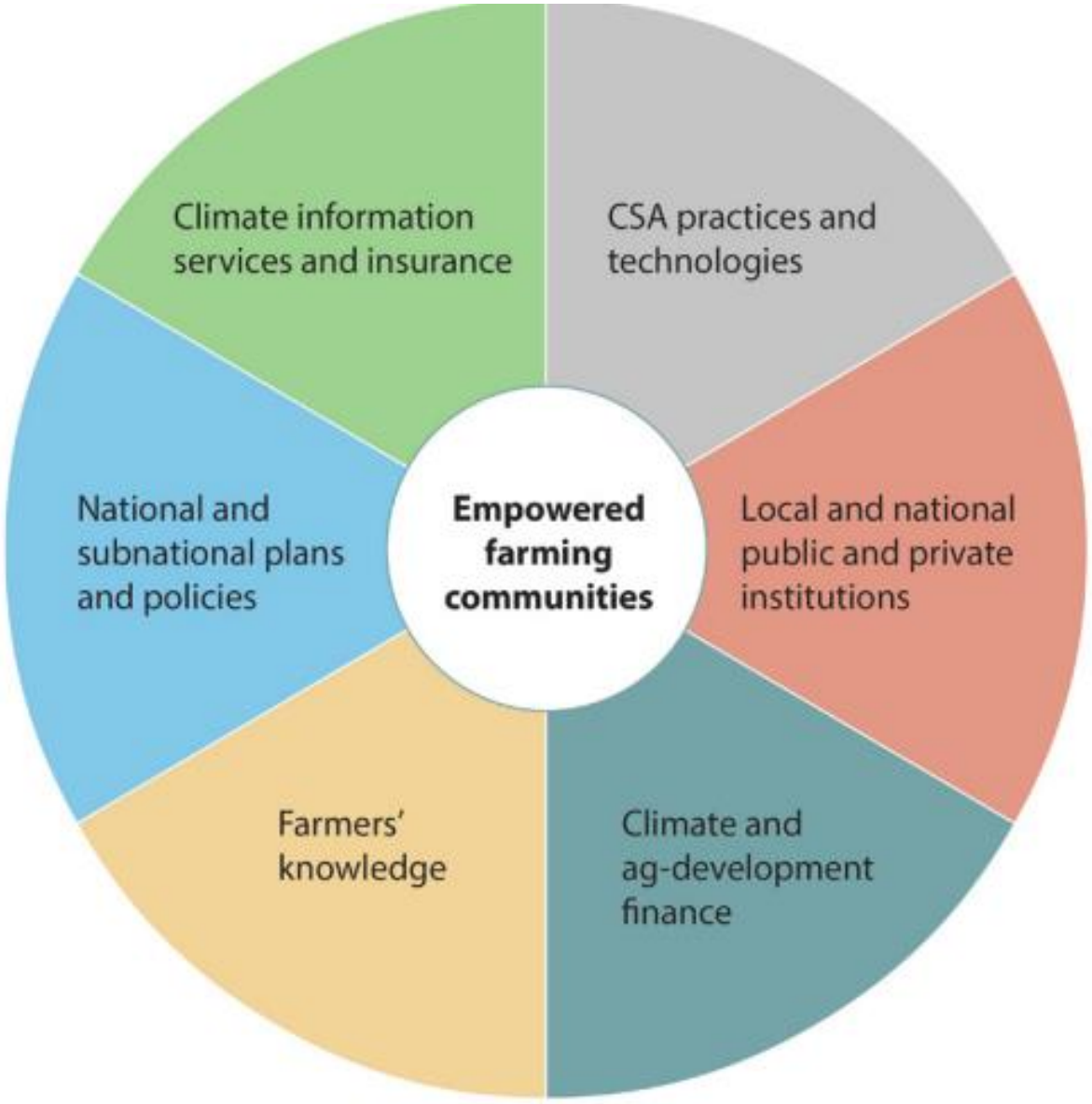
Figure 13: **Burkina**
Source: CSIR-CRI

Crop diversification

utilizing minor crops - Bambara for

- ✓ Extra income
- ✓ Reduce vulnerability to climate change.
- ✓ Cover crops for soil protection to reduce greenhouse gas emissions.

Components of climate-smart villages (CSV)

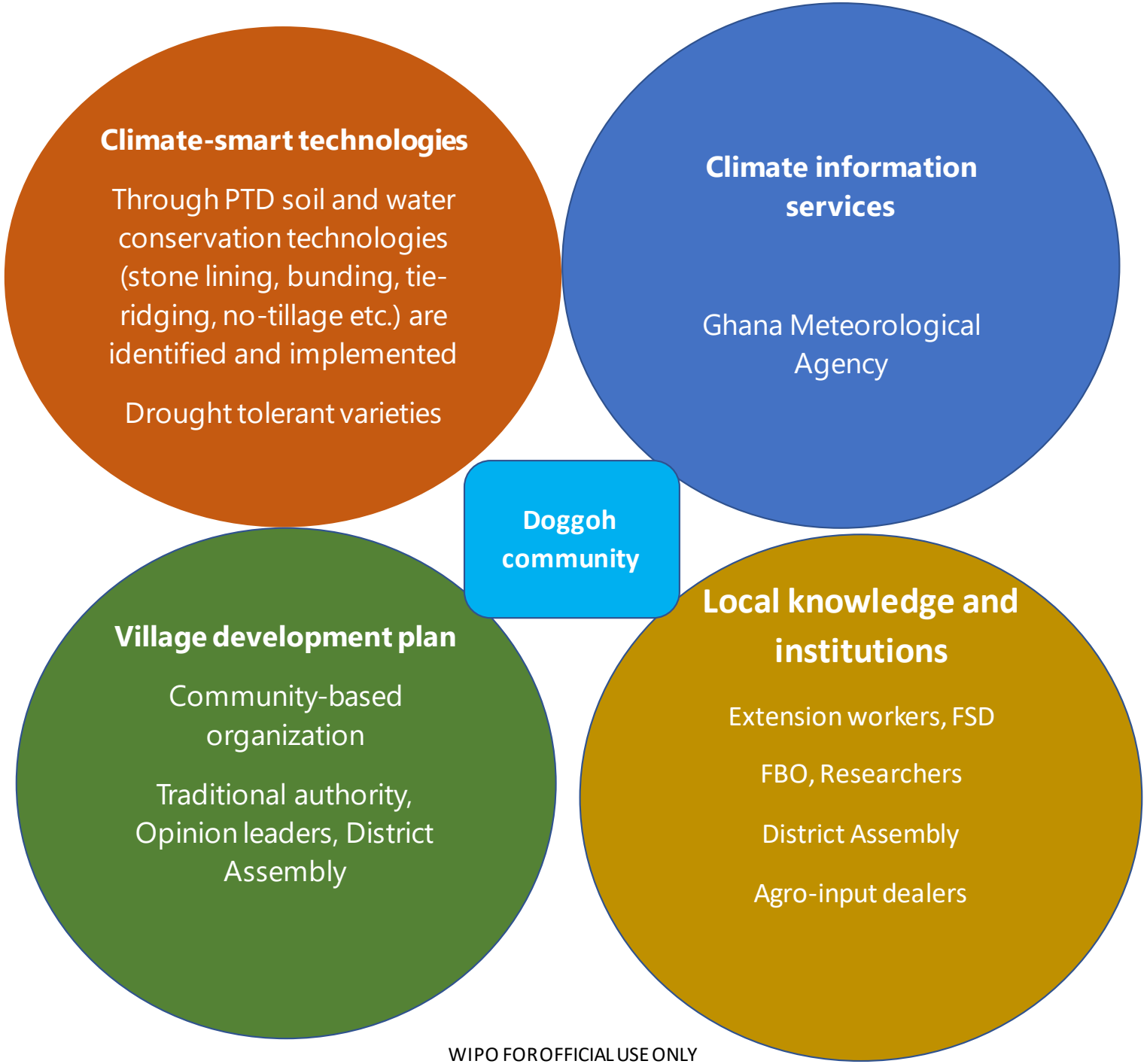


Location of the Climate-Smart Villages

- Lawra (Boompari, Dzuuri)
- Jirapa (Doggoh)

Technologies

- Climate information services, Climate-smart practices and Technologies and capacity-building programs



Urban agriculture

Figure 14: **Rooftop garden**

Figure 15: **Greenhouse farming**

Figure 16: **Community gardens**

E-agriculture

E-farming application

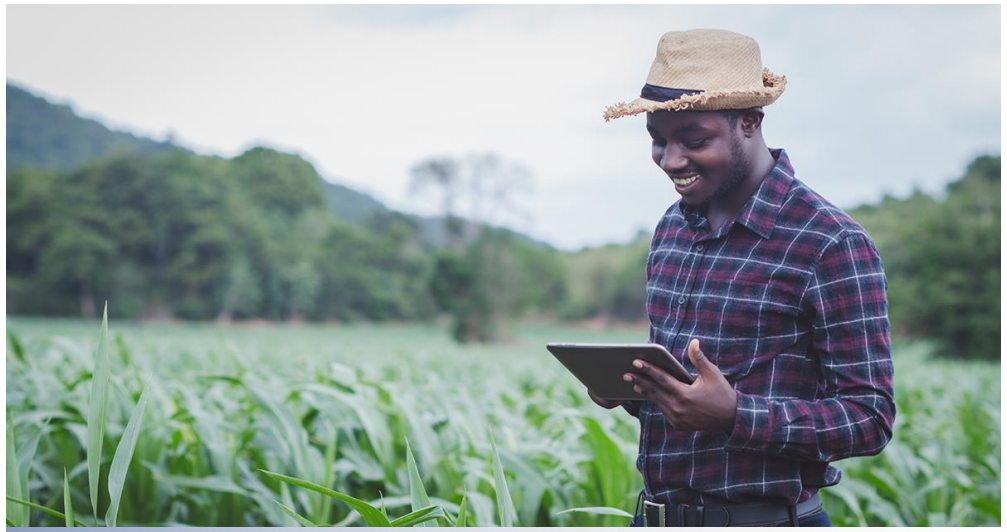


Figure 17: **weather forecasting, crop monitoring, market analysis and pest and disease management**

AI-based machines

Figure 18: **Autonomous Drones**

Figure 19: **Smart irrigation and autonomous tractors**

Organic fertilizers for improving soil fertility

Residue

Lactobacillus/ yeast cultures

Mixed resources is placed in an airtight barrel for fermentation

=

Fermented Fertilizer ' FermFert'

Figure 20: **Preparation of FermFert fertilizer.**

Source: Mavis Badu Brempong (CSIR-CRI)

Develop appropriate P-H technologies

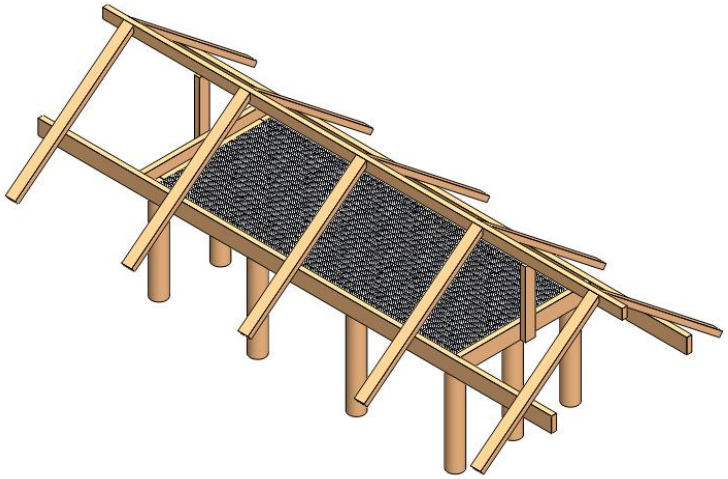


Figure 21: **Improved sun-drying equipment**

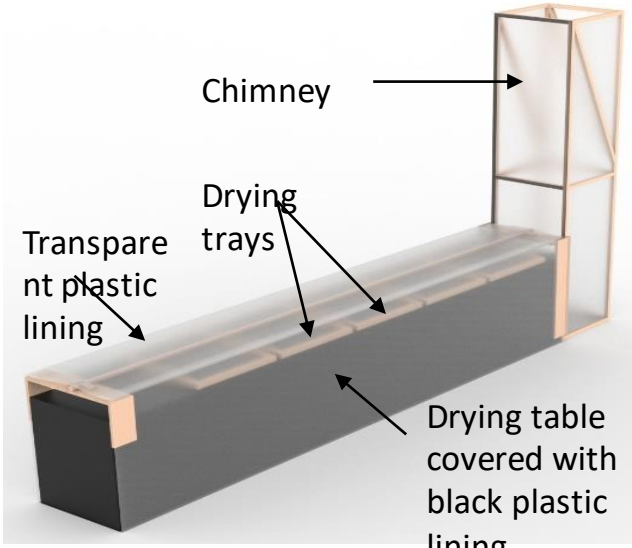


Figure 22: **Chimney solar dryer**

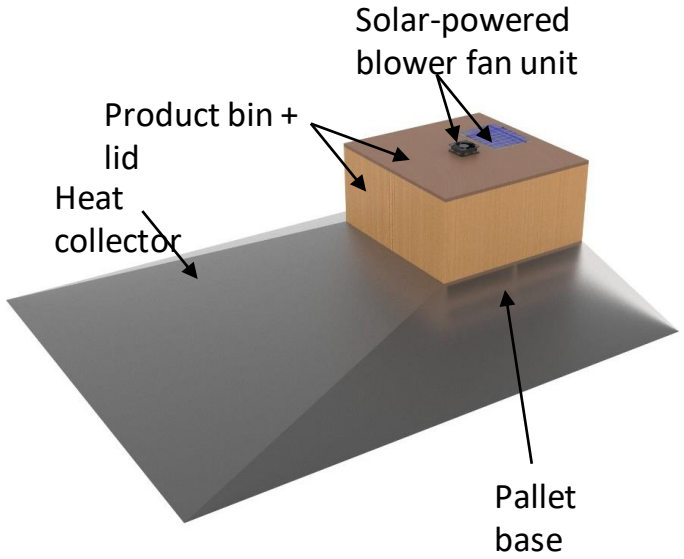


Figure 23: **Pallet solar dryer**

Figure 24: **Storage barn**

Figure 25: **product processing**

Source: CSIR-CRI

Develop appropriate technologies cont'd

Figure 26: **Harvesting by hand**

Figure 27: **Improved manual harvester**

Source: CSIR-CRI

How to motivate Individuals to dev & adopt innovative solutions?

Laws/Acts

- **Geographical Indications Acts 2003 (Act 659)** protects and registers the marks of products in Ghana based on their geographical origin.
- **Patent Act 2003 (Act 657)** grants protection for inventions and related matters in Ghana.
- **Trademark Act 2004 (Act 664)** protects trademarks and related matters in Ghana.
- **Plant Variety Protection Act 2020** aims to safeguard the rights of plant breeders and encourage the development of new plant varieties in Ghana through a legal framework.

Policies

- ✓ **Ghana's National Intellectual Property Policy (NIPP)** aims to promote innovation, protect IP rights, and use IP as a tool for economic growth.
- ✓ **Ghana's National Climate Change Policy** is aimed at enhancing resilience, reducing greenhouse gas emissions, and promoting low-carbon development.

IP tools and strategies

GI- protection

Ghana has developed and released about 300 varieties of various crops, **but none has been protected. PVP Act 2020(Act1050) to the rescue, when the LI is passed.**

Work is being done by GIPO, Ghana to protect the 'Pona' Yam vari

Figure 28: **GI protection of Pona Yam in Ghana**

Figure 29: **GI- protection of sweet cayenne pineapple**

Source: CSIR-CRI

IP tools and strategies

Geographical Indication

Ghana's cocoa has been granted GI protection under the World Trade Organization's Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement.

Figure 30: **Geographic Indication of Cococa in Ghana.**
Source: www.confectionary.com

IP tools and strategies

Geographical Indication

The Ghana Export PA has also been working to promote the protection of other agricultural products.

Obuase Ankaa(orange) in Ghana can be protected as well.

Figure 31: **Geographic Indication of Obuase 'Ankaa' (orange) in Ghana.**
Source: www.getty.com

IP tools and strategies

Patents

"K-Bio Fruit and Vegetable Spray" for controlling pests and diseases in crops.

patent protection can be used to also protect steps in technology development and the creation of new agricultural products or processes in Ghana.

Figure 32**: Fruits and vegetable wash**
Source: Veggie Wash

Conclusion

- ✓ Ghana has significant potential for sustainable crop production through innovative solutions that provide long-term environmental, economic, and social benefits.

- ✓ Innovation is crucial for sustainable agriculture. The presentation highlighted technologies dev'd by Ghana's NARS and how IP tools and public policies can promote productivity, sustainability, and food security.

- ✓ It is therefore crucial for stakeholders along the value chain to support and promote these innovative solutions to achieve sustainable crop production in Ghana through:

- Financial assistance (loans, grants or subsidies).
- Aggressive and targeted sensitization through education and training.
- Research and development for improved technologies (i.e., seed systems, etc.).
- Political will and policy support (i.e., tax incentives and regulations).

ACKNOWLEDGEMENT

THANK YOU!

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